THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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THE

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(J. A. BERLY'S),

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THE GERMANS AND THE NEW PATENT LAW.

THE protectionist, when it comes to the pinch, generally objects to the protection of other people. Our Free Trade Government has, in a fit of mental aberration, introduced a little "crude" protection into its new Patent Act, and we might have expected such thorough-going protectionists as the German manufacturers to be highly gratified. On the contrary, however, we find the influential concern, known as the Union of Industrialists, presenting a petition to the Imperial Chancellor, to the Federal Council and to the Reichstag, pointing out that the provision in the English Patent Act for the compulsory working of foreign patents will seriously injure German interests. The petition proposes: "(1) To secure through diplomatic channels the extension of the time limit from August 28th to at least a year hence; (2) To put into force similar measures against English patents in virtue of the German Patent Law, which admits of retaliatory measures; (3) To open negotiations with the British Government with a view to reforming as soon as possible compulsory manufacture of patented articles, by placing the inhabitants of both countries on an equal footing on the lines of the agreement reached between Germany and Switzerland."

According to reports in the newspapers, Dr. von Bethmann-Hollweg, the Imperial Secretary of State for the Interior, in his reply to the petition, has stated that the British Government has made a declaration whereby the situation for German patentees is put in a somewhat better light. "It was true that the British Government adhered to the view that the time limit of the new Patent Law was unaffected by the provisions of the international agreement for the protection of industrial property, but, in its reply to the Imperial Government in this connection, it expressly pointed out that Article 27 of the new law did not unreservedly demand the manufacture of every patent in Great Britain. The Comptroller and the Courts were authorised to consider the situation in every case, and, in given circumstances, were empowered to extend the time limit."

The matter has also been receiving attention in the House of Commons during the past week. A member asked the President of the Board of Trade whether diplomatic representations had been made asking for an extension of the time limit, and, if so, what was the decision of the Government in regard to the matter. Mr. Churchill, in reply, stated that representations had been received from the Governments of the United States and of Germany in respect of Sec. 27 of the Act, but that his Majesty's Government had no intention of proposing the fresh legislation which he was advised would be necessary in order to modify the provisions of the section.

Sir Alfred Jones is said to have estimated that up to the present, as a result of the new law, £25,000,000 of foreign, principally German, capital has been invested in England. Some writers on this new departure in English Patent Law appear to think that the discretion given to the Comptroller of Patents will protect the consumer from the higher prices that would follow from compulsory working at higher cost, but that would probably depend on whether the Comptroller happened to be a protectionist or a free trader.

The Legal Position of a Consulting Engineer.

Certain letters which have recently appeared in these columns draw attention to the employment of a consulting engineer. If his position in practice is not easy to define, it is even more difficult to ascertain his legal position as between employer and contractor. Is he an arbitrator or not? There are few cases on the point; and the lawyer to whom the matter is submitted usually has to consult decisions of the Courts relating to the employment of an architect. Even the position of the architect is not clearly defined. In a recent Scotch case (Robertson *v.* Jarvie (45 S.L.R. 260)) a question arose as to the authority of an architect to order extras.

It appeared that the plaintiff offered to do certain work for the defendant for a lump sum. The schedule annexed to the plaintiff's estimate provided *(inter alia)* that "The work to be done . . . . to the entire satisfaction of the proprietor or architect, who will be at liberty to make alterations, and to increase, lessen, or omit any part of the work. . . . ." The defendant accepted the offer, and on completion of the work the architect certified that the plaintiff was entitled to a sum which, owing to extras, exceeded the lump sum. In an action brought to recover the balance the plaintiff averred that the extra work had all been authorised by the defendant's architect, and that his certificate was final. In his defence, the defendant denied that the extra work had been authorised by his architect, and said that the architect had no power at his own hand to authorise it, and that the whole work executed did not, in many respects, comply with the contract. It was held that as the architect was not by the contract made an arbitrator, there must be an inquiry as to the question whether the additions and alterations had all been authorised by the architect. It was held, further, that assuming that fact to be proved, the defender could not, at least in the absence of very specific arrangements, object to the architect's final certificate, he having been allowed to act as measurer. Lord M'Laren gave utterance to the following *dictum*:—"I think that there can be no doubt that within the scope of his employment an architect is the proprietor's agent; and if the building contract provides that the work is to be done to the satisfaction of the architect, then any order within the scope of the contract which the architect may give is a sufficient authority to the tradesman to execute the work, because he is entitled to take the order of the agent as equivalent to the order of the principal." Applying the principle of this case to the position of a consulting engineer, it would seem that, if he has any discretion to increase the amount of work set out in the specification, he may render his employer liable therefor.

The Oldbury Tramway Accident.

Lieut.-Col. Yorke's report to the Board of Trade has been published, and we are glad to find that no one was in any way responsible for the overturning of the car, which resulted in the death of two persons and injury to several others.

The car ran off the rails just after entering a loop, and there is no doubt that this was caused by the collapse of one of the wheels.

Only 100 yards from the loop the driver stopped the car for a restive horse, and the evidence of an independent witness, who was about to board the car, proves that it ran into the straight lead of the loop at a speed of not more than 6 m.p.h., which is certainly slightly above the Board of Trade limit, but cannot be considered a dangerous speed under the circumstances.

The defective wheel seems to have been rather light for the work; it consisted of a cast-iron centre with a steel tire shrunk on, and the makers had sought to strengthen the design by casting the spokes round thin iron rods which extended from the rim to the hub. In our opinion this expedient would have the reverse effect to that desired, unless the mass of metal around the rods was sufficient to prevent shrinkage from the core, and the company have done the proper thing in replacing the whole of these wheels by the more usual type with amply heavy spokes.

The breakage of a car wheel is by no means uncommon, but it is very seldom that they collapse so entirely as did this one, in which the whole of the spokes were broken from the hub, and three of them separated from the rim, two others being cracked near the rim. The car had been overhauled recently, and this wheel had run only 25,000 miles, which is about a third, or less, of the life expected from a steel tire.

The Merit and Demerit System of Discipline.

It is so easy to suspend a man for a day or more, that the cruelty and immorality of the proceeding are glossed over in the mind of the tramway manager, if indeed, which we doubt, he ever thinks of those aspects of a custom which has become sanctified through long use.

We understand that punishment by suspension for every sort of offence is universal on the tramways of Great Britain, and we appeal, as we have appealed before, to the managers, superintendents and others who exercise the privilege of punishment, to allow themselves to think what suspension means to the men who come under their lash. The tendency of the age is to replace punishment through revenge by a combination of corrective and deterrent measures, which managers educated in the old school scoff at as sentimental and molly-coddling nonsense; but, just as no one was ever edified by the hanging of a man for petty larceny, so no improvement of the *personnel* of a tramway ever can spring out of the use of cruelty as a means of inflicting punishment.

Punishment there must be, we suppose, so long as there is crime, by which we mean the breaking of any kind of law; but, because punishment in the past has meant the infliction of pain, and that only, it is not needful that the rising generation of more highly educated individuals should be held in bondage by the definition. The manager who suspends an employé is creating casual employment, poverty, and degradation, and his action is felt in various degrees of pain by a number of entirely innocent persons.

We appeal even to that type of manager who upholds suspension on the ground that it is a convenient method of finding work for the men on his spare lists; for, obdurate though he may be, one never can tell at what moment his good angel may strike a spark of decency and of respect for his fellow-creatures from his callous conscience.

We have been induced to pen these words after reading the abstract of a paper on the merit system which appears in the *Street Railway Journal* of May 30th. There is nothing new in the paper, but it records that the system has been introduced over the whole of a large American tramway after careful trial on a smaller scale.

Marks up to 100 are given for good or bad conduct, each offence or meritorious action bearing a definite value. Every man has the right of access to his own record, and he is warned when the demerits reach 90 that he has only 10 more between him and dismissal.

The books are made up every six months, and prizes are given to the holders of the highest merit marks.

We do not gather from the paper whether demerit marks are expunged by the lapse of time, or whether marks earned by sinning have to be cancelled by marks gained through active virtue or by keeping out of hot water for a sufficient length of time. It does not fall to everyone, however well intentioned, to perform "meritorious acts," so we think that crimes should be purged automatically if the system is to be justly merciful.

If it is to be administered properly, a merit system should be handled by a board rather than by single persons, for by that means continuity and consistency are ensured, and personal bias is eliminated in a large degree.

Discipline by the rod is obtained at the expense of manhood, truth, and willing service, and is fatal to the maintenance of friendly relations between masters and men.

INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.

Last week we briefly recorded the doings of the above Association at Nottingham on the opening and following days. Of the first day's proceedings almost sufficient has been said. Bailie Wightman's paper formed the *pièce d'occasion*, and, needless to say, it was enthusiastically received by *confrères* hailing from over the border. We understand that an unofficial discussion took place of a prolonged character, the "kindred spirits" having brought the matter up later in the day. Wednesday's excursion through Derbyshire proved in every way enjoyable, the unclouded sky contributing much towards this end. The members journeyed by train to Matlock Bath, and from thence by brake through Cromford, the Via Gellia Valley, and over the upland plateau of the high peak, Grange Mill, to Tissington and Dovedale, where, after some 18 miles' driving, a substantial luncheon at the Peveril Hotel contributed not a little to the comfort of the inner man. The afternoon was spent "go as you please"; some ascended Thorpe Cloud, a conical height at the entrance of the Dale, whereon a gentleman from Barrow, celebrated for his statistical proclivities, discussed altitudes by the aid of a pocket barometer, while others, of greater avoirdupois, availed themselves of the local supply of donkey traction in the valley, with more or less success.

No more charming spot than Dovedale, with its leafy dells, limpid stream and wooded heights, could be found in which to pass such an afternoon.

We pass over the return journey, and turn to Thursday, which was devoted to serious business of divers kinds, morning, afternoon and night.

The annual general meeting, which took place in the morning, resulted in the forming of the following Executive Council for 1908-9:—

President.—* S. L. Pearce (Manchester).
Sen. Vice-President.—* W. W. Lackie (Glasgow).
Jun. Vice-President.—* J. Christie (Brighton).

Past Presidents.—

* H. Talbot (Nottingham).	* F. A. Newington (Edinburgh).
* S. E. Fedden (Sheffield).	* J. E. Edgcome (Kingston-on-Thames).

Council.—

Ald. Bruce (Sunderland).	* A. A. Day (Bolton).
Councillor Howarth (Manchester).	* A. C. Cramb (Croydon).
	* F. M. Long (Norwich).
Ald. West (Coventry).	* V. A. H. McCowen (Salford).
Councillor Sinclair (Swansea).	* H. Richardson (Dundee).
Ald. J. P. Smith (Barrow-in-Furness).	* C. E. C. Shawfield (Wolverhampton).
Ald. Wilkinson (Luton).	* T. P. Wilmshurst (Derby).
* G. Wilkinson (Harrogate).	

Hon. Solicitor.—Ald. Pearson (Bristol).
Hon. Treasurer.—* J. E. Edgcome (Kingston-on-Thames).
Hon. Secretary.—* H. Faraday Proctor (Bristol).
Secretary.—C. McArthur Butler (London).

* Engineers.

The annual report was subsequently adopted, some discussion taking place on the Supply of Electricity Bill and on the Great Eastern Railway General Powers Bill, and a resolution calling the attention of the Council to the proposed sale of electricity by private companies by means of wayleaves obtained from railway and canal companies and the dangers attendant on this course, was submitted.

In the afternoon, papers by Mr. H. Richardson and Mr. C. M. Shaw, to which we refer later, were read and discussed.

In the evening the annual dinner took place in the Exchange Hall; covers were laid for about 160, the Mayor of Nottingham (Mr. J. T. Spalding), the Sheriff (Mr. W. H. Carey), Ald. Sir John Turney, chairman, and many other members of the local Electricity Committee being present. The toasts of the evening were proposed by Mr. S. L. Pearce, Ald. Sir John Turney, and the Sheriff; Sir John, who proposed the "Incorporated Municipal Electrical Association," coupled with it Nottingham's electrical engineer, Mr. H. Talbot, and paid a high tribute to the services he had rendered to the city. An enjoyable musical programme contributed to the success of the evening.

Friday, being the last day of the Convention, resulted in a diminished attendance, when (in the morning) Mr. A. M. Taylor contributed a highly technical paper on "Alternating-current Accumulator Sub-stations."

As we shall deal with this paper and the discussion which followed it in a later issue, we will content ourselves with merely congratulating the author on his daring to present such a paper for discussion at the M.E.A., and those present on their fairly unanimous avowal of not having read a paper which they proceeded to discuss. If, as appears probable, the author overlooked the chance of a fog upsetting his calculations, he will all the more readily appreciate the undoubted fog, which his efforts to impart a 44-page paper on an involved subject in such a short time produced in the minds of his hearers.

After the above, one was not much surprised at the feeble reception accorded to the succeeding paper on "The Work and Equipment of a Testing and Standardising Department," by Mr. H. A. Ratcliff; that the latter was worthy of much more consideration than the available time permitted of, will be readily agreed.

In concluding, may we urge that a more liberal use of the notice-board at headquarters would be much appreciated by members intending to visit works in the neighbourhood; while local concerns bent on welcoming the members would be well advised to give more prominence to their intentions.

We say this with the feeling that the De Laval turbine plant at the British L. M. Ericsson Co.'s Works, at Beeston, would have received much greater attention from those present had its existence been generally known.

Some Considerations on the Design of a Generating Station.

Mr. Harry Richardson's paper on the above subject at the Municipal Electrical Convention admittedly deals superficially with what used to be a somewhat complex problem; nevertheless, it contains several points which are interesting, as they presumably refer to the author's undertaking at Dundee.

Power supply there, as elsewhere, necessitated the erection of a station which should be essentially a commercial proposition, reasonably low in first cost and able to generate at a low figure.

That the design selected is in the main similar to others of its class is, perhaps, not surprising, its inclusion of turbo-driven alternators and water-tube boilers being almost a foregone conclusion. The author points out that a station site near a river, on made ground, involves the securing of stable foundations in the first place, and to this end he favours a reinforced concrete raft resting on piles of a similar type.

He states that with distances of 25 to 35 ft. to the rock a safe load of 60 tons may be allowed on any well-constructed pile; and, further, advises more gentle treatment in driving than appears to be usual, recommending also that they should not be driven until 50 or 60 days old at least.

The cost of the foundation, including the raft, piles and reinforced work for the pipe track and pump chamber, was £5,800.

The author does not favour extending the reinforced structural work to the station buildings themselves, on the ground of expense both in first cost and for subsequent alterations; he recommends the usual steel skeleton building filled in with brickwork. Unfortunately the author gives no figure as to the estimated cost of his plant, but a reinforced concrete station, built under remarkably similar conditions and with similar plant, on the banks of the Thames, cost only some £13 per kw., which hardly points to extravagance. With the author's advocacy of steel skeleton buildings and corrugated iron walls, where possible, we cordially agree; as also with his plea for cleanliness in the boiler house.

In regard to chimneys, he found the comparative costs of different types to be as follows:—

Height and diameter.	220 ft. × 11 ft.	80 ft. × 9 ft.
Brick	£1,550	£400
Concrete	£1,300	£470
Steel	£1,460	£450

Two prominent builders of the second type of chimney gave it as their opinion that such chimneys would stand a temperature at the base of 1,500° F., no fire-brick lining being necessary, as a separate internal concrete shell was provided; steel chimneys, the author said, were costly in upkeep.

The author briefly discusses prime movers and steam generators; as regards the former it is interesting to note that he

Was very desirous of using gas engines in connection with a new power station, and with much optimism made most detailed and careful inquiries from owners and engineers who were using such engines of modern types. Some six months were spent over this work, as answers had in many cases to be got from abroad. The inquiries were limited to the larger units and latest installations. The results were extremely disappointing, in that by a large majority, opinions were unfavourable, principally on the grounds of unreliability, cost of upkeep, space occupied, first cost, and the inability to meet sudden overloads of short duration.

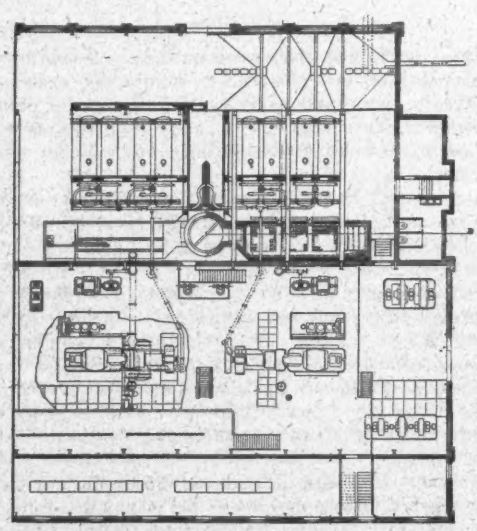
The above remarks apply, of course, to plants operated by producer gas.

On the question of draught, the author favours a "moderate pressure" system as against the usual "forced" or "induced" draught arrangements; he says:—

It is assumed that the air is supplied to a closed ash pit, and that the pressure above the fire is equal to or very slightly below that of the surrounding air. The difference of pressure necessary to overcome the resistance of the boiler flues and economiser would then be provided by a comparatively short chimney. It is submitted that the pressure draught is superior for the following reasons:—

In case of any leaks in the settings, the efficiency of the draught will be preserved, and as the difference in gas pressure between the interior of the flues, &c., and the surrounding air is much less, harmful air leakages will be avoided. If the quality of the coal is such as to require frequent opening of the fire doors to break up clinkers, &c., the inrush of cold air with consequent loss of efficiency and damage to brickwork and boiler will be avoided.

The size and consequent price of the plant is smaller.



Plan of Station.

He further adds:—

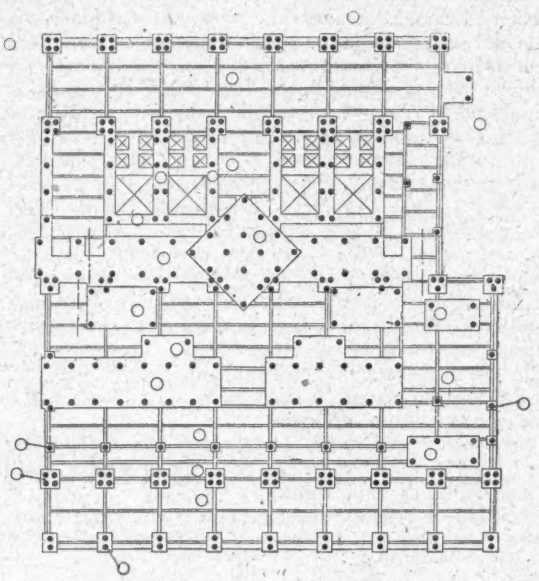
During the erection of extensions nearly all power stations are pressed, therefore it is recommended that everything should be constructionally ready for the installation of a pressure or induced draught, not in recognition of the superior economy of such apparatus, but in appreciation of their temporary utility in producing a desirable margin of power.

Nothing further, we should imagine, is required to justify the inclusion of some system of mechanical draught at the outset; a progressive station is always extending, and in any case the temporary overloading of a boiler plant, by means of artificial draught, seems only a natural accompaniment of the same treatment of the turbine and for similar reasons.

In regard to coal bunkers, the author directs attention to the use of reinforced concrete, as against steel, there being an estimated saving in cost of 25 per cent. for equal capacities; he also favours volumetric, as against weight, measurement of the coal in the boiler house.

Judging by his list of possible defects of the chain-grate stoker and the fact that he, in common with the majority of engineers, still adopts it, he presumably regards it as a necessary evil, especially as he gives it as his opinion that a well made chain-grate stoker is by far the most economical in all-round working.

To provide for the cleaning of economisers without the necessity of shutting down and cooling them, the author suggests specially designed screw conveyers fitted in sloping V-shaped compartments in the floor; and as regards the circulating water-pipe system, he points out that breakages sometimes occur where cast-iron pipes are embedded in concrete, due probably to excessive temperature variation, and that moulded reinforced concrete pipes have special advantages in the way of cheapness and durability.



Plan of Reinforced Concrete Foundation, Showing Piles.

The author is sinking a large vertical reinforced concrete cylinder for use as a pump chamber, to a depth of 30 ft.

Cellular switchgear, with ample space, and oil-break switches with a breaking capacity chosen with reference to the total K.V.A. capacity of the station on a momentary short-circuit, find favour with the author.

Mr. Richardson covers many other points, which, however, do not call for particular notice.

In the discussion which followed, Mr. S. L. Pearce pointed out that as regards pile driving, the heavy weight and short drop were generally preferable to the light weight and long drop as far as minimum damage to the pile was concerned. He doubted whether any concrete chimney would stand 1,500° F. without a suitable lining, as concrete became crumbly on dehydration at about 600° F. On the matter of gas engines, he thought Mr. Richardson's unsatisfactory replies were due more to the producer arrangement than to the engine. He was convinced that the latter had a future in this country. The class of gas did not greatly alter the engine design, and first-class Continental makers would guarantee results with any gas. The limit of power was about 1,400 H.P. per cylinder, and by using a four-cylinder tandem engine, a 4,000-KW. unit could be obtained. A gas engine plant would cost 25 to 30 per cent. more than a similar reciprocating steam plant; and in regard to space, a 4,000-KW. gas engine and generator would take up six times as much space as a 5,000-KW. turbo-alternator. According to recent evidence the best fuel consumption for gas engines was 1¼ lb. per unit, as against 2¾ lb. per unit by steam plant. He had considered Mr. Andrews's idea in regard to employing gas engines at Manchester; the night load never fell below 3,000 KW., and it was evident that such plant could be employed for continuous running there. He regarded 160 lb. per sq. in. as the economical limit of steam pressure for reaction turbines, and 160° as the maximum superheat permissible. High superheat accounted for endless trouble with turbine plant. Among other points, he advocated the adoption of every method of increasing the efficiency of condensing

plant, forced-air cooling for large generators, and the installation of three-phase motors for large auxiliaries.

MR. LEONARD ANDREWS said he had recently seen some gas engine tests, and 1·75 lb. fuel per unit was rather on the high side. In regard to the gas engine's lack of overload capacity, this would, to some extent, disappear in the future, as makers were now adopting a lower rating for their plants. He knew of an 800-KW. plant (with producers) in this country, which recently carried 920 KW. for two hours. It was difficult to get data as to the reliability of gas engines, as they were usually run by private concerns, which would not disclose their costs for the benefit of possible rivals. The repeat orders, however, obtained by the Continental makers showed that these engines were not giving a great deal of trouble. He thought that the idea as to producers being unreliable would shortly disappear, as it had done in the case of the gas engine.

MR. C. E. C. SHAWFIELD was in favour of the steel chimney, as it cost less than brick and required less foundations. He attributed accidents to reinforced concrete chimneys in America to carelessness in pouring the concrete. He had never been able to obtain a guarantee of more than 15 per cent. overload on any gas engine, taking sizes of 1,000 H.P. and above. His experience pointed to forced draught being in all cases less economical than induced; the latter enabled an adequate supply of air to get over the fire and burn the gases, giving a higher temperature.

MR. A. T. YATES pointed out that forced draught rendered back-firing possible; he advocated mechanical draught, though, on the ground of higher furnace temperature, quicker evaporation and the ability to deal with cheap coal.

MR. SEATON, on the subject of gas engines, reminded Mr. Pearce that he was not likely to be deliberately shown a gas engine which was doing badly. He knew of a modern steel works in France, which was conspicuous among similar works because it stuck to steam plant, for the reason that it was certain as to its reliability. The only thing they could say for the gas engine was that it should save fuel; he knew of cases, however, where the oil bill was largely wiping out the coal saving.

MR. C. TURNBULL pointed out the possibility of corrosion of the copper and destruction of insulation in gas-engine stations, as was the case at Johannesburg.

MR. C. C. ATCHISON said he had tried a suction method of withdrawing soot from under economisers, but it took four hours to do it and cost far too much; he advocated large flues and entrance doors on a scale large enough to admit a man and barrow. Back firing would not occur in a well-designed forced-draught plant, in which the air was automatically cut off when the furnace door was opened. Air leakage had been mentioned; this was a serious thing in economisers, especially round the chain vents. He got over it by plugging the vents, except for half an hour, morning and night, when the scrapers were in use—this being sufficient scraping for ordinary use.

MR. J. K. BRYDGES advocated the "underfeed" stoker in preference to the chain-grate, as also did Mr. W. A. Vignoles, the succeeding speaker.

MR. VIGNOLES pointed out that a concrete raft foundation must be uniformly supported, otherwise there was a danger of its tilting over; ferro-concrete piles also must be secure against the entry of moisture, otherwise the interior metal would rust away. He gathered (more from what was not said than from what was said) that gas engines were not satisfactory with producer gas.

MR. A. C. CRAMB and MR. H. R BURNETT also contributed some remarks, and MR. RICHARDSON (who mentioned that his choice in the matter of chimneys was a brick one, and that wood, equally with ferro-concrete piles, would suffer in damp ground) reserved his reply for the *Proceedings*.

The Worcester Steam and Water-Power Plant.

ANY paper on the reconstruction of an electric lighting scheme should be of interest to all those engineers whose fortune it is to have charge of the running of a plant, the inception of which took place in what are now known as the early days of the industry—say, for example, the early nineties; but a paper on such a plant as is dealt with by Mr. Shaw is doubly interesting from the fact that the undertaking at Worcester is one of the very few examples in this country where a combined steam and water-power station has been installed. The paper is a good example of what can be done towards economy and the placing of an undertaking on sound financial lines, and by this latter phrase I do not mean the making of a profit which may or may not be purely a paper profit each year, but on sound financial lines when viewed from the standpoint of making adequate provision for a reserve to meet depreciation and obsolescence of plant by alteration or additions to an out-of-date scheme.

There are many stations in the country having the same system as at Worcester, some of which have been modernised, while others are as badly in need of it as was Worcester when Mr. Shaw took it over. The Worcester scheme was complicated by the fact that there the water-power plant was installed, and it was all along felt that somehow or other this could be turned to useful account, but the great question was—how? When the undertaking was laid down in 1893, electricity supply was for lighting and lighting only, but even then great mistakes were made in the lay-out of this plant. The station was designed to be essentially a water-power station, and in consequence the steam plant, which was looked on purely as a standby, was put down without any regard to economy, while it surely must have been seen that every ton of coal would be enhanced in cost by something like 1s. 6d. through having to be carted a long distance from the railway station. The same mistake seems to have been made all through by those responsible for putting up the station, and this mistake was that there was practically always to be a sufficiency of water power. How erroneous this assumption was, is shown by the curves by which Mr. Shaw has illustrated the points in his paper. To my mind the greatest drawback of all to the undertaking as it then was, was the fact that, combined with a single-phase supply of 100 periods, the water was rather a financial drag on the undertaking than otherwise, the cause of this being explained in the following manner:—

In order to obtain the water-power, extremely heavy capital expenditure had been incurred, and the water-power itself was extremely variable, failing frequently either from drought or flood; and when the happy mean between these two came to pass, then for a very large part of the 24 hours good water was running to waste owing to there being no power load to take up the electrical power that could have been generated.

The first step towards a better arrangement of things was taken when the generating plant had to be extended, and a comparatively large supply given for traction purposes. At this period a lively controversy arose as to whether it would be better to extend the generating station at Powick, and change over to two or three-phase, still keeping the single-phase 100-cycle supply for the lighting demand in the suburbs of the city; or to put up a central steam-driven station supplying continuous current, so interconnected by means of a storage battery and motor-generator, that use could be made of the surplus water supply (when there was any) at Powick. The latter scheme was decided on, being the first step towards doing away with generation by steam at Powick, and doing all the steam generating in a place where coal could be obtained more cheaply, and, by laying the station out for economical steam raising, burnt to greater advantage. Thus were economies effected on the one hand; Mr. Shaw in his paper has pointed out the other way in which the financial affairs of the undertaking have been much improved. For a city like Worcester, where there are a good many power-using industries carried on, many of them using power in small units, and thus being a happy hunting ground for the station engineer, it was extremely galling to those having charge of the undertaking to find that with a single-phase 100-cycle supply it was practically impossible to get power users to go in for electric motors. The author well remembers one particular case, in which, after months of persuasion, he got a man to put in a 4-H.P. motor for sausage-making. This was right in the middle of the city, and was taken off the main low-tension network; when it was switched on for the first time it was seen by the drop in pressure and the blinking of the lights on the premises of all the consumers around that something would have to be done before the man could run his motor. A 20-KW. transformer was taken and tapped off the high-tension network, and the low-tension mains put in parallel with the service from the low-tension network; this made matters somewhat better, but still whenever the man ran his motor after dark it was quite noticeable in the premises around. With that sort of experience it was hardly to be wondered at that not only did power users not jump at alternating motors, but the engineer himself was almost afraid to advocate their installation, at least where there was much lighting. Several instances also occurred about that time in which large works began to generate their own energy, and transmitted continuous current to motors scattered over their works.

Mr. Shaw in his paper has pointed out the two main lines along which he went to bring about the financial regeneration of the station, the first being to lower the capital charges

per unit sold by so altering his system and his charges that a large power load was created, and not only did this power load cheapen the costs in the above way, but in this particular case, by using water which was otherwise running to waste, it was costing practically nothing for running charges. From the load curves and financial results for the last few years it can be seen how great this alteration has been, but not greater than the writer of these notes has all along thought possible in Worcester where, provided the selling end of the business is arranged satisfactorily, the generating conditions after the alteration of plant are almost ideal for supplying a big day load. One difficulty which Mr. Shaw does not seem to have touched on in his paper occurs to the writer, and this is that a great many of the people who would take a supply for power purposes are situated some little distance from the centre of the city where there is a continuous-current network, and would thus necessitate a considerable capital outlay on mains for their own particular supply, thus to some extent nullifying the special advantages obtained at Worcester by the use of water power; information from Mr. Shaw on this point, as to how much expenditure had to be incurred on special mains for these power consumers, and how it affected the selling rate of energy to them, would be of interest.

To sum up the paper shortly, I think that Mr. Shaw must be congratulated for the way he has set about a very difficult task, and, in my humble opinion, very little more could be done to improve matters than he has already carried out. The advantages, in short, seem to have been obtained by first of all cutting down the capital expenditure, both per kilowatt installed, by extensions at the steam-driven station, and per unit sold, by fostering a big demand for a day power load, and in addition the running costs have been enormously reduced, chiefly by the following means:—

First, making far more profitable use of the water-power, and selling a large number of water-generated units, the cost of which was practically nothing; by improving the boiler load factor; and by the use of a much more economical plant, doing away with the use of the old so-called water-power station as a steam-driven station, as it used to be for so many months in the year.—E. E. H.

The Reconstructions of an Electric Lighting Scheme, with Observations on the Working of a Combined Steam and Water-Power Plant.

(*Abstract of paper by* C. M. Shaw, *chief electrical engineer, Worcester.*)

Almost every engineer of a supply undertaking has at one time or another had to consider the very important question of the reconstruction or rearrangement of generating plant and mains systems connected thereto, especially where such undertakings were laid down in the early nineties.

There are two sources of prime movers in use at Worcester—viz., steam and water-power. Two systems of distribution irrespective of traction supply. Two methods of supply, alternating and direct, each having two standard pressures, and finally, two tariff systems with 19 separate prices for current.

Plant in Use in 1905.

Powick Station (*Water and Steam*).

420-kw. capacity driven by steam engines.
120-kw. " " water turbines.
240-kw. " " water or steam power by means of clutches.
Six water-tube boilers; 10,460 sq. ft. heating surface.

Hylton Road Station (*Steam*).

250-kw. capacity for d.c. supply.
500-kw. " " " or traction.
70-kw. motor-generator coupled to engine by a clutch used for a.c. or d.c. supply.
Three water-tube boilers; 9,420 sq. ft. heating surface.

The author devoted a full year to the close study of the conditions of working the two stations. As the systems at each works are different it was not possible to interwork the supplies beyond the capacity of the small motor-generator at the new works.

In due course, the author arrived at a decided opinion that no great improvements could be effected in the cost of generation with the old conditions of working the two stations, though the acquisition of a limited day load was having its effect on the costs.

The high working cost was in a great measure brought about owing to the heavy expenditure entailed in maintaining a steam plant and staff at Powick, when such plant was, during a great portion of the year, in-operative.

The author, therefore, recommended the scrapping of four small boilers, and all the engines, &c., at the old works, as obsolete and useless for the purpose of electricity supply, if the department intended to cater for a cheap power demand.

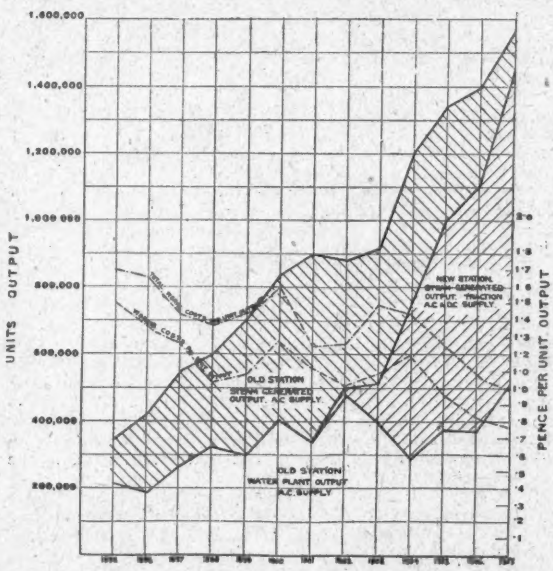
It was accordingly decided to dismantle the steam plant at Powick and concentrate all steam generation at the Hylton Road Works. Briefly, the advantages in favour of this change were:—

1. The saving of transmission losses.
2. The saving of coal cartage.
3. The benefits obtainable from the use of up-to-date triple-expansion engines.
4. Improvement of boiler load factor.
5. Saving in managament and attendance expenses.

In preparing the scheme for rearrangement of works, due regard had to be given to the following conditions which obtained at Worcester:—

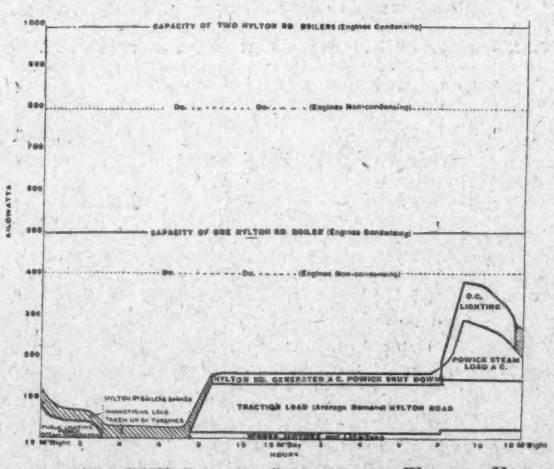
(*a*) The heavy capital expenditure already incurred.
(*b*) The area of supply, being very large, necessitates a h.t. system.
(*c*) The complete system of alternating mains and transformers already supplying outskirts and a portion of the centre of the City.
(*d*) The high periodicity of supply (100 periods single-phase) is unsuitable for power purposes.
(*e*) The system of d.c. feeders and distributors in the centre of the City and power area.

The change was particularly necessary for the following reasons viz., the imperative necessity for lower production costs, and an improved plant load-factor. Due consideration had to be given to


UNITS OUTPUT
PENCE PER UNIT OUTPUT
OLD STATION STEAM GENERATED OUTPUT A.C. SUPPLY
OLD STATION WATER PLANT OUTPUT A.C. SUPPLY
NEW STATION STEAM GENERATED OUTPUT TRACTION A.C. AND D.C. SUPPLY

Curves Showing Relation between Total Works Costs Works Costs and Outputs by Water and Steam Plants.

avoid increasing the then heavy capital expenditure more than was necessary, by adopting such a scheme that the saving effected thereby should give a substantial and immediate return sufficient


CAPACITY OF TWO HYLTON RD BOILERS (Engines Condensing)
CAPACITY OF ONE HYLTON RD BOILER (Engines Condensing)
D.C. LIGHTING
POWICK STEAM LOAD A.C.
HYLTON RD. GENERATED A.C. POWICK SHUT DOWN
TRACTION LOAD (Average Demand HYLTON ROAD

Curve (No. VIII) Showing Conditions of Working Under the Worst Water Conditions.

to extinguish the prime cost of the new plant in the least possible period.

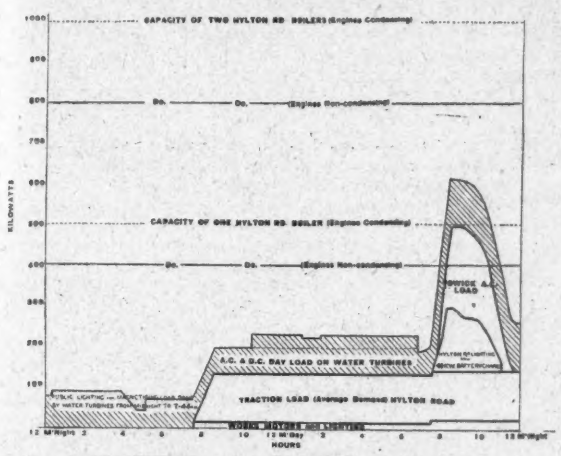
With this point in mind and with the knowledge that most of the local industries were in a settled state with little prospect of any abnormal growth, it was not advisable to carry out any com-

plete change of periodicity, as such was only necessary for a power load.

A very extensive single-phase A.C. 100 periods network had already been laid down at heavy cost in residential districts for the lighting demand. The area of supply was very extended, and the demand for power negligible, consequently a change-over to D.C. with the sacrifice of capital expended on H.T. mains, &c., would not have been justified.

It was, however, imperative that the old 100 periods supply be not extended more than possible, as such system might ultimately have to be changed.

New generators, switchboard, mains, &c., of a design easily convertible to 50 periods two-phase were accordingly installed. Fifty-period transformers of standardised capacity are also


CAPACITY OF TWO HYLTON RD BOILERS (Engines Condensing)
Do. Do. (Engines Non-condensing)
CAPACITY OF ONE HYLTON RD. BOILER (Engines Condensing)
Do. Do. (Engines Non-condensing)
KILOWATTS
SERVICE A.C. LOAD
A.C. & D.C. DAY LOAD ON WATER TURBINES
TRACTION LOAD (Average Demand) HYLTON ROAD
HOURS

CURVE (No. VII) SHOWING CONDITIONS OF WORKING WITH A GOOD WATER SUPPLY.

gradually displacing the original small 100 period types. A slight percentage in efficiency is sacrified by using these transformers, which loss, however, is neutralised by the reduction of open circuit losses.

In view of the foregoing remarks regarding the future, and that all present demands for power could be dealt with from the existing D.C. station, the following limited scheme was eventually decided upon:—

Extension of engine room for three generators ...		£1,150
Two A.C. steam generators, 350-400 KW.		4,550
Switchgear		200
Mains ... ...*		260
Contingencies		340
		£6,500
Less receipts from sale of old plant ...		1,650
Net cost		£4,850

Much consideration was given to this scheme, and the question as to how the cost of the change should be met arose.

The Local Government Board were communicated with, and sanction was eventually given to borrow £4,072 and £2,428 for three and 18 years respectively.

This procedure is not quite consistent with the usual practice of the Local Government Board, in that the Department have still to meet interest and loan charges on outstanding debt on discarded plant, for a further term of 12 years, even though same be non-existent.

The past year's results, for 15 months ending March 25th, 1908, clearly demonstrate the benefits resulting from the concentration of working and scrapping of out-of-date plant.

The 1905 works costs item of 1·193d., and the estimated works costs per unit sold has been reduced to ·824d.

This reduction is not altogether attributable to the more economical working of the rearranged plant, which has only been in operation six months, but to a combination of the economies effected by the new scheme. An increased power output, the increase of water output, and to the improved conditions of working the water plant resulting from our having full control of the whole water supply.

The water turbine room is of very ample dimensions, having been designed to contain four vertical "Victor" turbines of 54, 54, 48 and 36 in. respectively, and considerable duplicate steam plant.

In constructing this building, it was necessary to excavate to a depth of 38 to 45 ft. below the floor level, the latter being fixed some 3 in. above the highest flood, which occurred in 1886.

Belt-driven centrifugal governors were originally used for raising or lowering the cylinder gates, but this apparatus has been discarded as unsuitable.

As the available head very seldom exceeds 10 ft., it follows that large volumes of water have to be controlled quickly, otherwise the pressure of the supply quickly attains a dangerous limit if the load suddenly alters. Hand regulation of gates has proved to be the most satisfactory method of control, though the question of motor control is under consideration.

Curve No. VII shows the more economical condition of working, when the water is good, and the benefits that would have been derived had all steam plant been concentrated at one station.

Turning now to a similar built up Curve No. VIII, you have an example of the worst conditions experienced with the turbines, when it is better to store up water for use on the peak and deal with all output from the steam plant.

Attention is drawn to the rise and fall of works costs from year to year, which, with one or two exceptions, inversely follows that of the water output.

Undoubtedly, it is necessary to have a market for all current generated by water plant, otherwise full advantage cannot be taken of such power.

In conclusion, the author has no hesitation in saying that a water-power plant similar to that at Worcester is of great value, if there be a direct market for such power, without the intervention of wasteful storage entailing heavy capital expenditure. He does not consider any system of storage entailing accumulators of sufficient capacity to take the maximum output, as justifiable, as the maximum only endures for short periods.

The proper combination is to build up a sufficient mean load throughout the day, that such mean shall be greater than the maximum of the water output, surplus demands being taken up by steam sets of suitable size.

The discussion which followed was brief in character, Messrs. E. E. Hoadley, J. K. Brydges, W. A. Vignoles, and the President, Mr. H. Talbot, contributing. The author was congratulated on his efforts to make greater use of the water-power than formerly, and on the successful results achieved.

MR. VIGNOLES did not think that a case had been made out for water-driven plant in English central stations; if all the plant were concentrated in one station and larger units used, he believed that decreased capital and working charges would result—but, of course, the author had done his best under the conditions. The speaker also doubted the efficacy of hand-governing if large motors were in circuit.

MR. SHAW added that the plant had been put down in a very expensive manner originally, and this hampered the working, but in the future he considered that there would be a gain from the water-driven plant.

L. B. & S. C. R. ELECTRIFICATION.

FROM a neat illustrated souvenir issued by the Brighton Railway Co. on the opening of the new station at Victoria, we gather some particulars relating to the improvements effected there, and the progress of the conversion of the London Bridge-Victoria section to single-phase working.

The new station covers nearly 16 acres, and has 2¼ miles of platform, covering an area of 40,000 sq. ft.; the old station covered only 8¼ acres. It has involved an expenditure of considerably over £1,000,000 to effect this change. The new station has 9 wide platforms, each about 1,500 ft. in length, with standing room for 18 trains. Platforms 1 to 4 are to be used for suburban line trains, and the remainder will be given up principally to the main line traffic.

The old station was approached by two lines, one up and one down, and through this "neck" the whole of the traffic had to pass. The company has more than doubled the facilities for working the trains in and out of the terminus, providing five tracks, and is announcing improved services to south coast towns and the suburban districts.

The signals, points and crossings, which of necessity have been largely increased, are controlled and operated electrically from three signal boxes, known as the "North Box," "South Box" and "Shunting Box." The system of signalling adopted is Sykes's electro-mechanical system. The North Box contains 106 levers (83 electrical and 23 mechanical); the South Box has 269 levers (163 electrical and 106 mechanical); and the Shunting Box 22 levers (11 electrical and 11 mechanical). The principal advantage of the electro-mechanical working is that all signal wires are dispensed with, and rather less than half the space is required for the cabins. The electrical levers being much smaller than the mechanical, the signalman has them near at hand. The electric movement is slightly quicker than the mechanical. Further, when electric fouling bars are depressed by vehicles occupying certain lines, the electric control, which formerly was operated by the signalman in the North Box, is now operated by the vehicles themselves.

The signalman in the North Box observes and controls the whole of the platform movements, while the man in the South Box sectionises the different trains on arrival and departure, and the man in the shunting box deals with the marshalling of trains in the carriage sidings.

A novel feature is the movable diamond crossings, which are operated from the South Box, the movement being electrically detected by the signals.

The station has been designed to separate the main line and suburban traffic as much as possible, and at the south end of the eastern side offices is the electric switch cabin, to be brought into use when electric trains are running.

The section of the line at present being electrified extends from Victoria to London Bridge, a distance of nearly 9 miles, equalling

approximately 23 miles of single line. In Victoria Station five platform and two through lines, and in London Bridge Station six platform lines, are being electrically equipped.

The improved service contemplated will require seven working trains and one spare one, each train comprising two third-class motor coaches with luggage and motorman's compartments, each equipped with four 125-H.P. motors. The motor coaches form the first and last coach of a standard three-coach train, the middle one being a first-class trailer coach. It is proposed to give a ten-minute service throughout the day; the time occupied by a journey from Victoria to London Bridge, or *vice versa*, will be 25 minutes, including stops, as compared with 36 minutes at present required by the steam trains. The total seating capacity of each three-coach train is 188.

Contrary to the American practice of adopting coaches of the tramcar type with end doors, which have been used on the underground railways, and which have proved draughty and inconvenient, a modified form of side-entrance compartment coach has been designed, so that in the case of any one compartment being full, passengers can pass into the next without having to leave the carriage, this arrangement giving greater convenience to passengers and saving time at the stations.

The overhead conductor consists of a heavy grooved solid wire, $\frac{1}{2}$ in. in diameter, which is supported at every few feet by means of dropper wires suspended from stranded steel catenary cables, which are in turn suspended from massive porcelain insulators through a double insulation which has been tested to ten times the working pressure. The insulators are supported upon specially designed steel structures.

Due to the constantly varying nature of the line on this section, a very great number of different types of support have had to be designed, the strength of these having been calculated with a factor of safety of 10 to 1, which has in all cases been worked to in the overhead equipment.

The overhead conductor is divided into sections at each station, specially constructed switchgear being provided in fire-proof cabins for the control of the sections. By this means it is possible to isolate any section of the line in case of necessity, and in order to secure the safety of those whose duty it will be to make repairs or carry out inspection a system of inter-locking has been devised.

A complete system of telephone communication exists between all the switch cabins, as well as the signal box adjoining to them, and by the use of simple electrical relays the signalman can, in case of emergency, cut off the energy from the overhead line on the sections which are controlled by him.

The switchgear has been designed so as to be as simple as possible, and it is arranged that any stationmaster, signalman, or other authorised person can easily and safely operate the switches without danger of their coming into contact with any apparatus under high pressure.

In order to meet the conditions which have been imposed in the case of the South London line as regards voltage drop in the return circuit, with a view to complying both with the provisional requirements of the Board of Trade, and the requirements of the Admiralty in respect to interference with apparatus at the Greenwich Observatory, a special system of cables was rendered necessary, and a duplicate feeding system has been provided throughout the line, everything having been so designed as to secure certainty and safety of operation.

Up to the present time the cables have been laid between Batterseа Park and Queen's Road Stations, and 11 of the 13 switch cabins have been erected. The switchgear in four cabins has also been completed, and the work of equipping the remainder is in active progress.

The supply of energy is to be obtained by the Brighton Co. from the London Electric Supply Corporation, whose mains from their station at Deptford to the switch cabin at Queen's Road Station have already been laid and tested, and whose railway generating plant, consisting of four units of some 2,000 KW. each, is in readiness at Deptford to supply the requisite power.

For the normal work of the line it is estimated that one of these units will supply sufficient power, so that there is little fear of failure due to lack of generating power. In addition to the power cables, in order to avoid all possible danger of interference with the many telephone and telegraph circuits which exist along the line, the overhead wires in the majority of cases have been removed and the circuits carried in lead-covered air-space cables, metallic returns being substituted for earth returns in all cases.

Many serious difficulties have been encountered during the equipment of the line, since the section which is being dealt with includes two terminal stations, together with numerous low bridges.

The tunnels at Denmark Hill have also added a difficulty owing to the nature of their construction, and to the curvature of the line in the tunnels. Practically all kinds of construction which go to form a railway are met with on this length, and very many obstacles have had to be considered and overcome in designing a satisfactory equipment.

The nature of the embankments has rendered special foundations necessary in many cases, and these have had to be piled to a great depth in order to ensure stability.

Another difficulty in connection with the low bridges at Victoria Station which has been a serious obstacle, is that the railway servants have to work upon the roofs of trains in the terminal stations, and consequently the overhead conductor had to be placed at a height of 21 ft., rendering it necessary to design a special form of current collector bow capable of working satisfactorily at high speeds through a range of between 21 ft. and 14 ft., giving a vertical movement of 7 ft., and this has been by no means an easy task. It has also been necessary in order to ensure the safety of passengers and railway servants under these low bridges, to design and adopt special devices whereby it will be impossible for accidental contact to be made with the high tension equipment.

From an article in the *Railway Times* we learn that within the next few months the Brighton Railway will have two motor-cars in service, in which an attempt is made to combine the efficiency of the mechanical drive with the ease of the electric control. The Auto-Mixte system is to be employed. In this system the armature of a dynamo is carried on the main driving shaft from the engine to the differential. A battery is connected to the terminals of the machine, which is of the ordinary shunt-wound type. When the vehicle is starting up, the battery discharges through the machine, and it acts as a motor, thus helping the engine, and increasing the starting torque on the wheels. When the car is running at full speed, the E.M.F. generated in the armature is greater than that of the battery, so that, in normal running on full speed, the battery is receiving a small charging current. When running down hill this charging current is materially increased, while for up-hill work, as the speed of the car decreases, the E.M.F. of the generator falls below that of the battery, so that it ceases to generate, but runs as a motor helping the engine on the incline. With this system, an engine of small capacity may be used, and it is always running at its maximum efficiency, viz., full load, as the battery is being charged, when the full power of the engine is not required to drive the car.

The trial motor-cars are being fitted with petrol engines of 120 H.P. capacity by the Daimler Co. The dynamo is rated at 50 H.P. as a motor. There are 48 accumulator cells, arranged in four boxes. When starting the car from the rest, the four boxes are connected in parallel, and the four field coils are also in parallel. By this means a heavy starting current may be taken from the cells, and the strength of the field magnets is in no way reduced. There are four stops on the controller: (1) Four boxes of cells in parallel across the the armature and four field coils in parallel; (2) the cells in two sets, two in series, two in parallel, the field coils being arranged in the same way; (3) the boxes in series with a rheostat in series with the armature, the field coils being now in full series across all the cells in series; (4) the cells in full series across the armature, the field coils also in full series. By this means a very large starting torque is obtained—the current taken from the cells when the car is fully loaded being about 1,000 amperes on the first stop, and about 600 amperes on the second. By this means a high acceleration will be obtained. The controller has necessarily to be a large one, but it will be fitted with one of the best forms of blow-out on the market, so that even the 1,000-ampere arc will be safely blown out.

LEGAL.

ERNEST SCOTT & MOUNTAIN, LTD., *v.* KENT COLLIERIES, LTD.

IN the Divisional Court on Tuesday, before the Lord Chief Justice and Mr. Justice Ridley,

MR. BOUSFIELD, K.C., mentioned this case, and said he had to apply for a stay of execution pending appeal. The case, he stated, had been before the Official Referee, who gave judgment for the plaintiffs for £1,826 upon the claim and counter-claim.

MR. C. A. RUSSELL, K.C., objected to the stay of execution unless the amount of the judgment was paid into Court.

After some discussion,

THEIR LORDSHIPS granted the stay of execution upon condition that the amount of the judgment was paid into Court.

HILLS PATENTS, LTD., *v.* DICK, KERR & CO., LTD.

ON Tuesday in the King's Bench Division of the High Court, Mr. Justice Channell, taking the special paper, had before him the case of Hills Patents, Ltd., and Dick, Kerr & Co., Ltd.

MR. COLFAX, counsel for the defendants, said this was a matter which raised the question as to whether or not Mr. H. F. Hills, one of two plaintiffs in the action, should not be struck out on the ground that the statement of claim which had been delivered, disclosed no right of action by Mr. Hills. The defendants took out a summons to have Hills dismissed from the action. The summons came before Master Chitty, and he ordered that a question on a point of law be argued, and that order was confirmed by Mr. Justice Ridley. The action was brought to restrain the infringement of Letters Patent 28,932, of 1902, the patent being known as an improved safety apparatus for use in overhead electric tramways. Hills was the inventor of the patent, and had parted with his interest in it to a company, and the company had all the rights in respect to it. The defendants sought to get security for costs against the company, but failed on the ground that there was a co-plaintiff on the record, although he did not think there was any suggestion that he could satisfy the defendants as to costs. Hills assigned the patent to the company, and that assignment was subsequently registered. Although the assignment was not registered until after the date of infringement of the patent, he submitted that Hills ought not to be a co-plaintiff.

MR. PATRICK HASTINGS, counsel for the plaintiffs, asked that the name of Hills should not be struck off as one of the plaintiffs. Hills, he said, was the inventor of the patent, and he had assigned

it to the company. There was no doubt that the patent had been infringed, and defendants were continuing to infringe it.

Mr. Justice Channell, in giving judgment, said he should be very reluctant to strike out the name of Mr. Hills, and deal with the case piecemeal. He was quite clear that Mr. Hills ought either to be plaintiff alone, or joint plaintiff in respect of damages prior to the actual assignment. That being so, if the statement of claim showed no other right of action, it did show that he had a right to be joined in seeking damages prior to April 3rd, 1906. That being so, it was sufficient for disposing of the motion, which he must dismiss, the costs to be costs in the cause.

D. Santoni & Co. (1906), Ltd., *v.* Farringdon Engineering Co.

In this case, heard at Clerkenwell County Court last week, plaintiffs sued for £45 16s. 10d. in respect of 314 armature coils supplied for use on a tramway system. According to a report in the *Islington Gazette*, plaintiffs' Counsel said that the coils were made to defendants' order and to sample. Defendants complained, and returned the coils. Counsel for the defendants said that there was a defect in the coils.

Mr. Tasker, chief consulting engineer to the plaintiff company, said he saw a number of the coils tested before being sent out. They were tested with ten times the working pressure. Following the complaint from defendants, he tested with a pressure of many times the working pressure, and in no case was there a fault or defect of any kind. In September they had a complaint that the coils were inferior to what the defendants had supplied the Birkenhead Corporation with previously, and in January defendants returned the whole lot as rejected.

Cross-examined, he did not swear that in the winding of the coils new wire was used. It was taken from an old machine that had been in use at Whitehaven and which was sent to them for reconstruction, because they were altering their pressure of supply. It was a fair and proper thing to use the old wire. It was certainly good. Perhaps 90 or 95 per cent. were made from the old wire.

The foreman of plaintiffs' armature winding department said that the test applied was a proper one to be applied to coils for use on tramway systems.

An expert to whom a number of the coils had been submitted said he had made thorough tests and found them quite satisfactory.

Mr. Lever, for the defendants, said the real issue was whether there was proper insulation between turn and turn in the coils. The defence contended that such insulation was insufficient. Thirty-three of the coils were used in the tramway system of the Birkenhead Corporation. They short-circuited at once, and would not bring the car out of the yard.

Mr. James McLennan, chief engineer and manager to the defendant company, said they had supplied coils for the Birkenhead Corporation tramways some six or nine months previous to supplying the coils now in dispute. The first coils were made by another firm, and were quite satisfactory. After the coils supplied by plaintiffs were dispatched to Birkenhead, he received a complaint. He saw Mr. Tasker, and told him that the coils had broken down. Mr. Tasker asked if it was due to rough treatment in being placed in the slots. Witness replied that he had not received particulars from Birkenhead. The Corporation complained that the coils supplied were not similar to the original sample.

His Honour thought it very necessary that the original sample should be produced. It would also be helpful if someone from the Birkenhead Corporation attended to speak as to what happened when the coils were tried.

Witness went on to say that he made an examination of the coils complained of. He found the wire brittle and very much discoloured. It looked like old wire. In his opinion, it was not proper wire to use for winding coils. Never in his experience had he heard of wire that had been in use for 15 years on a dynamo, being used again for new coils.

The hearing was adjourned.

A Morecambe Electric Lighting Account.

At Lancaster County Court, before Judge Hans Hamilton, the Morecambe Corporation sought to recover £30 14s. 2d., value of electric current supplied from October 2nd, 1906, to December 31st, 1906, to Walter Pyrah, of the King's Arms Hotel, Morecambe. The point at issue was whether the jurisdiction of the Court was ousted by the appointment of a meter inspector. His Honour held he had ample jurisdiction. Mr. Humphries (Halifax) for the defendant, admitted that the figures registered by the meter were in accordance with the claim sent in by the Corporation, but the register was wrong. His Honour gave judgment for the plaintiffs, but granted stay of execution for a fortnight in order to give an opportunity to appeal. Special costs were granted.

Holidays.—Among other evidences that we have received that this is the season for holiday-making, is an advance copy of the Great Eastern Railway Co.'s new handbook, "East Coast Holidays," by Percy Lindley. A special feature has been made of the illustrations, which show in colours some of the more popular resorts in this part of the country. Prominence is given to some less-known districts in East Anglia and to the country between the Cromer Coast and the Norfolk Broads.

PARLIAMENTARY.

South Wales Electric Power Bill.

On Thursday, July 2nd, Mr. Partington's Committee of the House of Commons considered the South Wales Electrical Distribution Bill, which has already passed the House of Lords.

The case was opened by Mr. Lloyd, K.C., and Mr. Ram followed for the opponents (Pontypridd District Council).

Mr. Stanley Boulter said that the debenture-holders were in favour of the scheme. It was the best chance of saving the wreck. He said that the prospects of the company had improved somewhat lately.

Mr. W. A. Chamen, the electrical engineer for the company, gave evidence, and after further evidence had been called the Chairman suggested that the parties should come to terms. After an adjournment it was announced that terms had been arranged.

Mr. Verney Knox said that the parties had agreed that instead of the guarantee of 30,000 units it should be somewhat smaller, and further, a clause would be inserted to the effect that the customer of the company in the Urban District Council's area should not be allowed to use more than 20 per cent. of his supply for lighting purposes. A clause would further be inserted to enable the District Council to get a supply if they needed it on "the most favoured nation terms."

The Committee declared the preamble proved, and ordered it to be reported for third reading.

Third Reading.—In the House of Commons on July 3rd, the Macclesfield and District Tramways (Abandonment) Bill was read a third time.

BUSINESS NOTES.

Santoni Flame Lamps.—Messrs. J. & H. Grevener write as follows under date July 7th:—"With regard to the notice appearing in your last week's issue to the effect that the 'Santoni Arc Lamp and Engineering Co., Ltd.,' of 11, Farringdon Avenue, E.C., are proceeding against us for our statement *re their* 'Santoni' flame lamps—although at the time of writing we have heard nothing of such proceedings—we should like to point out to the trade generally that we are not concerned with the lamp offered as the 'Santoni' lamp by the said company, which has only just been formed. This particular lamp is of different make to the lamp *formerly* known as the 'Santoni' flame arc lamp which used to be supplied by the D. Santoni & Co. (1906), Ltd., which company, however, has now ceased business. We are now, as we have already informed your readers, the *sole vendors* of the lamp *formerly* known as the 'Santoni' flame arc lamp, with all its accessories and spare parts. Except, however, for supplying spare parts and accessories for the same, we are taking it off the market in favour of our improved model, which is known as the 'Arcoflame' intense flame arc lamp."

In the opinion of the Electrical Review it is high time that these trade amenities were brought to a conclusion. The heavy demands upon our space will not allow us to continue to occupy our readers' attention with them. Could not the differences in question be easily settled by reference to an arbitrator?

Consular Notes.—Colombia.—The German Consul at Medellin, in a recent report, states that electric light and power plants for public purposes have only been installed in Medellin and Jerico. In recent times, however, the London banking firm, Schloss Bros., have made contracts with various other municipalities for the installation of electric plant.

China.—The German Consul at Tientsin, in a recent report, states that, in August, 1906, the French Concession authorities and the Cie de Tramways et d'Eclairage de Tientsin concluded a contract granting to the latter company the monopoly for the installation and exploitation of an electric tramway for the transportation of passengers and goods for the same period as the contract between the company named and the Chinese Government for the installation of electric tramways (*i.e.*, 50 years from July 7th, 1904). A part of the service, which forms a communication with the international station in the Russian Concession, and which will be extended to the borders of the French Extra Concession, is already working. The authorities of the British Concession have been negotiating with the Gas and Electric Light Co. for the substitution of electricity for gas in the houses of the Concession. The power station, which is not large enough for present purposes, is to be enlarged and extended.

Roumania.—The Austrian Consul at Crajova, in a recent report, states that the importation of electric lighting and power apparatus and accessories is largely increasing. German manufacturers hold about 75 per cent. of the trade. The other 25 per cent. is divided between Austria, France and Hungary. The total import amounts in value to about 1,250,000 fr.

SIAM.—The Austrian Consul at Bangkok reports that, in 1907, the Siamese Post and Telegraph authorities invited tenders for the installation of new telephone plant in Bangkok to admit of serving about 1,500 subscribers instead of only 700, as at present. The contract was obtained by a Swedish firm. Since the North German Lloyd have requested that communication should be established between the island of Koh Si Chang and Bangkok, the agent in Bangkok of the Gesellschaft für Drahtlose Telegraphie, system Telefunken, has been endeavouring to obtain the permission of the Siamese Government for the installation of wireless telegraphy. The Nord-Deutsche Lloyd have offered to work the system on their own account, and it is stated that this will have considerable importance from a trade point of view, since during a great part of the year the island of Koh Si Chang is used as a loading station.

GERMANY.—The *Handels Museum*, of Vienna, in a recent article on the foreign demand for German electro-technical goods, states that one of the few German industries to suffer from the present trade depression which exists in that country is the electro-technical industry. How great an increase will be shown in the inland trade in the course of the year, it is difficult to say, although the growing demand for further means of transport has given rise to many projects which will call for the supply of electrical goods. But as regards the foreign trade, it is easy to show the increase which has already taken place. The large works have secured orders in numerous countries which will ensure a larger trade than last year. They are so great, indeed, that the falling-off in trade with Great Britain will have little effect on the final results. The exports of the German electrical industry in the first four months of 1908 amounted to 24,956,000 kg., as against 19,270,800 kg. in the corresponding period of 1907. Therefore, the exports this year are about 30 per cent. higher than the exports of last year. This increase has been distributed over all the four months, and was fully maintained in April. The value of the goods has also increased, for the German electrical industry plays such an important part in the world's trade that it can afford to be independent in its price policy. It must be noted, therefore, that the increase in the exports is not an artificial result of the flooding of the home market. The increase in exports was chiefly shown in the trade with Italy, South America, Sweden, Norway, and Roumania. The largest increases are shown in the exports of dynamos and transformers. The exports of machines weighing up to 100 kg. amounted in value to 1,277,400 marks in the first four months of 1908, as against only 81,300 marks in the first four months of 1907. Dynamos over 500 kg in weight were valued at 10,000,000 marks, as against 5,960,000 marks in 1907. Italy is the chief purchaser of dynamos, and the exports to that country showed large increases. In these machines an increase is also shown in the exports to Great Britain, as well as to South Africa, France, Belgium, and South America. Cables showed a moderate increase, the large decrease in the exports to Great Britain being doubly compensated by large increases in the exports to Chile and Sweden. The exports of appliances for electric lighting and power increased from 5,000,000 marks in January-April of 1907, to 10,000,000 marks in the same period this year. The exports of these goods to Sweden increased by 130 per cent., and the exports to Belgium were doubled.

CHINA.—The British Consul at Nanking, in a recent report, states that a company was formed in 1906 for the construction of electric tramways in the town, and in 1907 another company was started for the installation of electric lighting. The electric tramway scheme has been superseded by the City Railway, which is a Government undertaking. No apparent progress has been made in these projects, which is ascribed to the difficulty experienced by companies in finding capital; foreign shareholders are strictly excluded, and the vagueness of the company law in China makes Chinese capital distrustful.

GREECE.—The British Consul in the Piræus states that the electrification of the tramway system of Athens has progressed, and it was anticipated that some of the important lines would be ready by May, 1908; 15 cars have already been received, and some 90 more are expected shortly, these having been ordered in Milan. The company, though practically of Belgian origin, is now styled "Société Hellenique des Tramways d'Athène-Pirée et Environs." This company has head offices in Athens, and is capitalised at 20,000,000 drachmas (£714,286), divided into 200,000 shares of 100 drachmas (about £3 10s. 6d.).

JAPAN.—The British Consul at Hakodate reports that a new concern, which should have a considerable influence on the industries and trade of Hakodate, is the Oshima Hydro-Electric Power Co. When their works are completed it will be possible for the various industries to obtain power at as cheap a rate as can be obtained by concerns further north, which use steam. The Oshima Electric Works are situated about 20 miles from Hakodate, near the outlet of Lake Onuma, from which the water is led in a flume some 6 ft. square and 3 miles long to a point where a fall of 220 ft. is obtained. The average flow of water is 140 cb. ft. per minute. The total horse-power available is 3,500 H.P., but at first only 1,500 H.P. is to be supplied. The cost per horse-power supplied is to range from 5 yen to 15 yen (10s. to £1 10s.) which will effect a saving of over 35 per cent., as against the present cost of power using steam plant. The capital of the company is £100,000. This concern has already taken over the electric lighting of Hakodate, and it is hoped will electrify the present horse tramway system.

SICILY.—The British Consul at Palermo, in a recent report, states that various improvements in telegraphic communication in Sicily are being effected. At present there are two iron wires between Rome and Palermo; a new bronze wire, 554 miles in length will be laid, besides a bronze wire to Messina, and another of the same kind 563½ miles long, joining Rome with Catania. All these are to be operated on the Baudot system. New iron wires are to be laid between Palermo, Caltanisetta, Catania, and Girgenti, besides a new multiple cable across the Straits of Messina. The Morse duplex system will be adopted between Palermo and Caltanisetta, and on the Messina-Syracuse line; the Hughes system (simplex) on the Catania-Syracuse, Palermo-Girgenti, and Palermo-Naples lines; the Hughes duplex on the Palermo-Messina and Messina-Catania lines. The Baudot duplex is to be adopted on the Rome-Catania and the Naples-Catania lines, whilst the Baudot quadruplex is to be employed on the Rome-Messina, Rome-Palermo, Naples-Messina, and Messina-Bari lines.

During the second half of 1907 the public telephone system of Italy passed into the possession of the State, which promised cheaper telephones and better service—not yet realised. The direct service between Rome and Palermo is still very unsatisfactory.

A wireless telegraph station is to be set up at Palermo in communication with Naples and Cagliari in Sardinia. A wireless station is in operation between Messina and Calabria for railway purposes. A Marconi station at Cozzo Spadaro, in the Province of Syracuse, is annexed to the naval semaphore station there.

The British Vice-Consul at Messina reports that, in November, 1907, an agreement was made between a Belgian society and the Messina Town Council for the laying down of electric tramways in the city.

FRANCE.—The *Zeitschrift für Elektrotechnik* states that in the Alpine Coast District in France engineers are just now working hard at several large hydro-electric installations which are intended to combine for supplying energy to Nice, Cannes, Monte Carlo and Marseilles. The intention is to erect three new stations merely for supplying electric energy to the last mentioned town; a 20,000-H.P. station will be built at Aiguines, one for 18,000 H.P. in Ventavon and one for 15,000 H.P. in Bultanc. The pressure on the transmission line will be 50,000 volts.

AUSTRIA-ITALY.—According to the *Bolletino delle Finanze of Rome*, the Italian Government has been assured by the Austrian Government that the telephone line from Cormons to the Italian boundary will be united to the Italian service in the course of the present year, and that the Austrian telephone system of Friuli will be extended in order to cope with the new requirements.

MEXICO.—According to a German contemporary, a company has been formed in Mexico with a capital of 500,000 pesos, to establish long-distance and wireless telephonic communication between Mexico and Vera Cruz The company has been formed by Francisco Affara in combination with certain London capitalists. The concession for the installation of the long-distance and wireless telephonic stations in the district lying between the towns named had originally been obtained by Manuel S. de Corbera and Engineer J. Sitzenstatter, of Mexico, for 50 years with the right to establish services between the various towns of the district. In the towns of Vera Cruz, Cordoba and Orizaba underground cables are to be laid, and more than 5 km. of underground cable has already been laid in Vera Cruz. The installation of wireless telephone plant will be postponed for the time being, and the work of installing wire communication carried on. It is proposed to install telephone systems throughout the whole State of Vera Cruz, so that all the rubber, coffee, sugar and other plantations may have telephonic communication.

TURKEY.—The British Consul at Monastir, in a recent report, states that a proposal has been made by a Turkish contractor to construct and work an electric tramway some six miles long, from the railway station through the town to the large village of Nagarevo, but so far no satisfactory terms have been offered. The project has not yet been thoroughly worked out, either from the technical or the commercial point of view, and it is not certain that the water supply from which it is proposed to obtain power is sufficiently constant.

BELGIUM.—The French Consul at Brussels, in a recent report, states that the statement of the steam apparatus authorised in Belgium on December 31st, 1905, shows that there were 26 462 engines, of a total power of 2,064,556 H.P., fed by 24,686 boilers of 1,457,128 sq metres of heating surface; in 1905 there were 27,052 engines of a total power of 1,946,496 H.P., and in 1904 25,679 engines of a total power of 1,825,634 H.P. Deducting the number of engines and boilers for navigation and transport (railway and tramway) purposes, the number of steam engines in these industries was 19,759 (against 19,561 in 1905 and 19,472 in 1904), with a total power of 870,601 H.P. (against 813,208 H.P. in 1905 and 777,400 H.P in 1904) and the number of boilers 18,284 (against 18,143 in 1905 and 18,042 in 1904), having a heating surface of 986,596 sq. metres (against 960,799 in 1905 and 942,795 in 1904.) The extractive industries had 4,625 engines, of 269,574 H.P.; the metallurgical industries 3,270, of 165,978 H.P.; the textile industries 1,270, of 116,355 H.P.; the agricultural, &c., industries 5,634, of 112,651 H.P.; and other industries 4,954, of 205,822 H.P.

"Metalik" Lamps.—MESSRS. G. M. BODDY & CO., of Newington Works, Liverpool, inform us that they now supply the high-voltage 50-C.P. Metalik lamps in round bulbs, which are preferred for street lighting by some engineers; and small size Metaliks for chandeliers, giving 32 C.P. at 70 to 130 volts.

For Sale.—From MESSRS. WHEATLEY KIRK, PRICE AND CO., of 46, Watling Street, London, E.C., we have received a pamphlet containing plans and illustrated descriptive particulars of the freehold works, at Dagenham, of the Morris Aiming Tube and Ammunition Co., Ltd., which are offered for sale by private treaty. The works have a complete electric light and power equipment, of which details are given.

"Simplex" Time Recorders.—Messrs. J. C. Plimpton & Co. recently received an additional order for 10 "Simplex" time recorders from Messrs. Belliss & Morcom, Ltd., making a total of 26 machines they have now in use. The firm have also lately received a large order from Messrs. George Craddock & Co., wire rope manufacturers, Wakefield, and one from Messrs. Green's economiser works, Wakefield, for their system of time recording, besides very many others.

Book Notices.—*Les Rayons Cathodiques.* By P. Villard. Paris: Gauthier-Villars. Second edition. Price 2 fr. —Important alterations have been made in the new edition of this work, which forms part of the "Scientia" series. Certain chapters have been omitted, thus affording space to deal more fully with the titular subject of the book. The author describes first apparatus and methods employed in his own researches, and goes on to deal with the fundamental laws of the passage of electricity through gases. A new chapter is devoted to X-rays and ions, and the properties of the cathode rays are discussed at length by elementary methods. The book is well illustrated.

"Atti della Associazione Elettrotecnica Italiana." March-April. Vol. XII, No. 2. Milan: Rebeschini di Turati e C. 1908.

A new monthly journal has been established in Paris, entitled "Les Matières Grasses" (Fatty Substances) by M. A.-D. Cillard Fils, 49, Rue des Vinaigriers. Its object is to deal with the oil and fat trades and the associated industries, including petroleum, soap, glycerine, varnishes, colours, &c. Price 20 fr. (France), 26 fr. (abroad) per annum.

"Fortschritte der Elektrotechnik." 1907. Vol. III. Edited by Dr. K. Strecker. Berlin: Julius Springer. 1908. Price M.10.

"Gas Engine Manual." By W. A. Tookey. London: P. Marshall & Co. 1908. Price 3s. 6d. net.

"Electrical Engineering." By W. Slingo and A. Brooker. New Edition. London: Longmans, Green & Co. 1908. Price 12s. 6d.

Catalogues and Lists.—Messrs. E. Brook, Ltd., Colne Road, Huddersfield.—July price list of single-phase motors held in stock at their works.

Scott Electrical Co., Newark, N.J., U.S.A.—Small pamphlet describing the Scott flaming arc lamps.

Messrs. Turners & Manville, Ltd., 5, Lloyd's Avenue, London, E.C.—Eight-page pamphlet entitled "What is Voltax?" It gives information relating to the "Voltax" insulating and anti-corrosive varnishes. We understand that the firm make grades of Voltax for every conceivable purpose, such as for preventing corrosion on metal work under or above water, for all kinds of electrical insulation, as a water, acid and alkali-proof covering for the internal and external decoration of car bodies and the like. It is stated that the insulation of Voltax varnishes is 3,000 volts per mil, and when applied to metal they will stand up against the flame of a Bunsen.

Siemens Bros. Dynamo Works, Ltd, York Mansion, Westminster, S.W.—A hanging show-card of most effective design has been issued by this company, fixing the word "Tantalum" in the mind of the purchaser who enters the premises of the contractor or the supplier. It tells that the "Tantalum" is "the best and most successful metal-filament lamp."

Thalassol Manufacturing Co., 29, Red Lion Street, Clerkenwell, E.C.—Pamphlet relating to "Thalassol (Hermite solution)," practically, it appears, the same substance as is being prepared at Poplar by Dr. Alexander. The solution is manufactured under the Hermite process.

The Helptophone Co., Ltd., 42, Old Broad Street, E.C.—Leaflet showing their "Helptophone" adjustable holder for the standard telephone sets, which can be used in all positions, on desk, table or wall.

Messrs. John Spencer, Ltd., Globe Works, Wednesbury.—Copy of the twenty-fourth edition of their small illustrated price list (80 pages) of iron and steel tubes and fittings, arc lamp and tramway poles, &c.

The Helis Cell and Accumulator Co., Ltd., 175B, Kentish Town Road, N.W.—Small 8-page leaflet containing some information concerning the "Helis" cell and tests as to its life.

The Sun Electrical Co., Ltd., 118-120, Charing Cross Road, W.C.—20-page illustrated catalogue relating to their various types of A.C. and D.C. electric fans for desk, bracket, ceiling and other positions. Punkah fans, lampholder fans, also centrifugal and other fans are shown, and prices are given in nearly every case.

Union Electric Co., Ltd., Southwark, S.E.—New list, No. 1,012, containing particulars, with tabulated information and prices, of Union D.C. motors, and "Fortiter" motor starters. The list gives for the range and horse-powers that it covers a very large number of alternative speeds for the different horse-powers. Dimensional drawings are also given. At the end of the list there appear particulars of air-cooled as well as oil-cooled motor starters with no-voltage and overload release devices.

Messrs. H. A. Jackson & Co., Caxton Works, Salford, Manchester.—36-page catalogue, in which are shown a few designs of the firm's hand-beaten *repoussé* fittings for electric lighting. Some very artistic designs of hand-beaten and hammered work pendants, hall lanterns, electroliers, and ceiling fittings are illustrated, and prices are stated.

Messrs. Alexander Wright & Co., Ltd., 1, Westminster Palace Gardens, Victoria Street, S.W.—8-page publication giving a detailed description of the Simmance & Abady new patent standard tape recorder, and the principles upon which it is based. Among the features claimed for the instrument are the following:—Its scientific construction, ensuring the absolute accuracy of every part; the recorder is made with a continuous chart, which only requires changing every 60 days instead of every 24 hours; the record made can be snipped off at any convenient period, giving a 24, 48, or 7-day record at will; the recorders are made in various ranges—on the one hand to show as low as $\frac{1}{10}$-in. head of water, or, on the other hand, 20 atmospheres' pressure. By many engineers the instrument, which is of English manufacture, is considered to represent a distinct advance. A second booklet issued by the company particularises their automatic CO_2 recorder with continuous chart, built on the same lines as the above.

Messrs. E. Reader & Sons, Phœnix Works, Nottingham.—A number of illustrated lists in binder, describing briefly and giving sizes, weights, code-words and prices of their vertical enclosed steam engines, horizontal steam engines, enclosed high-speed single-cylinder and compound engines, and steam dynamo sets, for which they supply the engines.

Dissolutions and Liquidations. — Illuminated Signs, Ltd.—A petition presented by creditors, for winding up this company, is to be heard at Wandsworth Court House on July 13th.

Reed's Electrical Co., Ltd.—This company is winding up voluntarily, with Mr. D. S. Fripp, 90, Cannon Street, E.C., as liquidator.

Chipping Norton Electric Light and Power Co., Ltd.—This company is winding up voluntarily, with Mr. A. Harlow, 8, Maitland Park Road, Haverstock Hill, as liquidator.

Buenos Ayres and Belgrano Electric Tramways Co., Ltd.—This company is winding up voluntarily, with Mr. J. B. Concanon, 28, Austin Friars, E.C., and Mr. H. S. M. Woodrow, 52, Moorgate Street, E.C., as liquidators.

Schmidt Stationary Engine Co., Ltd.—This company is winding up voluntarily, its business having been taken over by Schmidt's Superheating Co., Ltd.

Allan Electrical Syndicate, Ltd.—Creditors must send particulars of their debts, &c., to Mr. H. G. Ash, 3, London Wall Buildings, the liquidator, by August 4th.

Meldrum Bros., Ltd., and Societe Meldrum, Ltd.—Creditors of both these companies must send particulars of their debts, &c., to the liquidator, Mr. Theodore Gregory, 3, York Street, Manchester, by August 14th.

Bankruptcy Proceedings.—W. Wardle.—At the Manchester Bankruptcy Court on Friday, Walter Wardle, electrician, of Osborn Road, Levenshulme, Manchester, was publicly examined before Mr. Registrar Atkinson as to the cause of his insolvency. His statement of affairs showed a deficiency of £1,097 6s. 3d. on unsecured liabilities estimated at £1,117 6s. 3d. Examined by the Official Receiver (Mr. J. G. Gibson), the debtor attributed his failure to claims upon him in respect of the outstanding debts of a former partnership and depreciation of shares allotted to him as part purchase money of his business. In May, 1907, a limited company was formed to take over his business, and up to the time of his bankruptcy he had acted as managing director of the company at a salary of £4 per week. The company had been worked at a profit. The examination was closed.

J. H. Calcott, electrical engineer, late of Clayton Works, Little East Place, Kennington.—At the London Bankruptcy Court on July 1st, the public examination was held, the statement of affairs showing total liabilities £5,191, of which £1,945 is unsecured, and assets £5 12s. 2d. absorbed in the preferential claims. It was stated that an arrangement was being made to set aside a portion of his pension to provide for the payment of a composition of 10s. in the £ to the creditors. The examination was concluded.

F. B. Egginton, electrical engineer and contractor, 11, Tempest Street, Wolverhampton. — A meeting of creditors was convened to be held at the office of the Official Receiver in Wolverhampton on Thursday in last week, but no creditors put in an appearance, and the affairs of the debtor will therefore be dealt with by the Official Receiver in the ordinary way. The liabilities are £99, due to 19 unsecured creditors, and the deficiency is £82.

Exhibition at Hanley.—At the Hanley Horticultural Show and Fête, there was an electrical exhibition tent under the auspices of the Hanley Corporation, the arrangements having been made by Mr. Yeaman. Mr. Rock, the North Staffordshire Railway electrician, lent and fitted up apparatus illustrating the electrical block system of signalling. Mr. H. W. Teeton had a stand of electrical appliances, and Messrs. W. A. Meadows & Co. a stand of power exhibits. In the evening the horticultural and children's show tents were illuminated by the electric light.

A German Trade Development.—A new development is proposed to be made by the Bergmann Electricity Works Co., of Berlin, which, commencing with installation materials some years ago, proceeded to embark upon the construction of dynamos, glow lamps, &c., and gradually increased its share capital from £50,000 to £850,000. Now the company proposes to devote attention to the conversion of steam railways to electric traction, with special reference to the Bavarian railways, and thus intends to become a competitor of the Allgemeine Co. and the Siemens-Schuckert Works Co. and other undertakings. It appears that the company has for some time past been occupied with experiments in connection with electric railways, secondary railways and tramways. In order to be able to derive advantage from the experience gained, an agreement has been concluded with the Westinghouse Companies whereby the right has been obtained to utilise the whole of the patents, designs, &c., belonging to these companies. The Westinghouse interests have recently entered into contracts with the Italian Government for the construction of railways to be equipped with 40 200-H.P. locomotives, and this is considered to be of importance to the Bergmann Co. in conjunction with the results already achieved by

the Westinghouse Companies, particularly as the execution of similar work has now become a prominent question of the day in Germany. As a consequence of the negotiations undertaken with the Paris Westinghouse Co., it is stated that the Bergmann Co. has acquired the rights from the former as well as from the Pittsburg, London, Genoa and Berlin Westinghouse Companies for manufacturing in Germany only. In return for the rights which relate to the direct, three-phase and single-phase systems, the company will give a share in the profits or pay royalties.

Monorail Electric Transporters.—Messrs. Kramos, Ltd., of Bath, have just secured a repeat order from Messrs. S. Pearson & Son, Ltd., Hull, for the supply of two of their cab-controlled monorail electric transporters for handling cement for harbour construction. The transporters will travel on a single I girder along the sea front at a speed of 60 ft. per minute, and will lift 3-ton loads at 30 ft. per minute, and lighter loads of 10 cwt. at 100 ft. per minute. All the motions are controlled by an operator who travels in the transporter cab.

Trade Announcements.—The Ebonestos Manufacturing Co. have removed their works and offices to 127, Pomeroy Street, Old Kent Road, S.E., where they will have double the accommodation afforded at their last address, and will install a new set of high-pressure hydraulic presses to meet the increased demand for their moulded Ebonestos insulators.

Mr. James R. Bell, M.I.C.E., has changed his London office address from 25, Victoria Street, to care of Messrs. T. A. Martin and Co., of Vestry House, Laurence Pountney Hill, E.C.

Messrs. G. M. Boddy & Co., of Liverpool, have opened a branch in London at 15, Gray's Inn Road (Holborn end), W.C., for the convenience of customers in London and the South of England. Telephone No. 4,814 Holborn. Mr. E. Slade Templeton is manager of the branch.

Mr. L. G. Tate, the secretary, informs us that owing to the progress of the Electrical Contractors' Association, it has been decided to take larger offices at the same address, 20, Bucklersbury, E.C. The offices are now at No. 582, on the fourth floor instead of on the lower ground floor, and the telegraphic address and telephone number are unaltered.

Annual Outings.—The annual outing of Messrs. J. H. Heathman & Co.'s staff, which took place on Saturday, July 4th, consisted of a launch trip from Kingston-on-Thames to Windsor and back. About 120 attended and had a most enjoyable run up river, the weather, though dull, being fine, save for a severe thunderstorm on the return journey. Luncheon and tea were served on board, and the proceedings were enlivened with music, for the great part of excellent order and execution, by members of the staff and visitors. Before reaching Kingston on the return journey a vote of thanks to Mr. Heathman was proposed by Mr. Stark and seconded by Mr. Wildey, both representing the staff, and was enthusiastically received. Mr. Heathman suitably responded, and trusted that trade would continue at such a level that he might hope to see all present next year.

The annual shop holiday of Messrs. Gent & Co., Ltd., was enjoyably and successfully held on Saturday last. The employés journeyed to Cleethorpes, and after visiting Grimsby docks assembled together for tea provided by the firm, who had also contributed towards the railway expenses. On the journey home the managing director and the works manager took a prominent part in the entertaining.

On Saturday, the 4th inst., the staff of Messrs. Veritys, Ltd., Manchester, held their annual picnic, proceeding by train from Manchester to Skipton, where lunch was provided at the Devonshire Hotel; thence the party enjoyed a pleasant drive through Yorkshire scenery to Ilkley, visiting Bolton Abbey on the way and returning to Skipton for dinner.

The annual outing of the employés of Messrs. Stegmann & Co., of Clapham Junction, took place on Saturday, July 4th, to Hastings.

LIGHTING and POWER NOTES.

Aldrington.—The statement of accounts of the bulk supply undertaking in this area shows that the Hove Corporation purchased some 23,612 units and distributed same at a cost of £493. The income, however, only amounted to £488, and, allowing for financial charges, a deficit of £503 remains.

Argentine.—The German Electric Light Co. has presented the Buenos Ayres Municipality with plans and descriptions of the various edifices, lands, machinery, cables, &c., the property of the company. The details are:—Four stations having installed plants capable of generating 29,490 kw.; 17 sub-stations, 10 of which are installed at tramway company's buildings and the remaining seven on the property of the company; the converters have a capacity of 13,600 kw., whilst the existing six batteries have a capacity of 11,976 ampere-hours. The company possesses other properties not mentioned in the inventory, viz., a piece of land alongside the South Dock on which a station is being built, and the old station which belonged to the Rio de La Plata Co., which is now only used to store cables and other electrical material. The complete length of the cable in use works out to 1,671,868 metres; installations in private houses number 14,434. There are 100 transformer stations, where some 280 transformers are used, capable of dealing with 10,323 kw.

Burnley.—The T.C., at the request of the Electricity Committee, has sanctioned an expenditure not exceeding £6,000, for the purchase of a 750-kw. generating set. The Electricity Committee was undecided whether to have an engine or a turbine set, and a deputation has been appointed to visit Durham to inspect a direct current turbo-generator.

The L.G.B. has sanctioned the following loans for electricity purposes:—£8,842 for boiler-house extensions, £6,272 for additional generating plant, £2,500 for mains and services, and £500 for meters.

Ashford (Kent).—The Folkestone Electricity Supply Co., Ltd., has informed the U.D.C. that it intends applying for a prov. order for E.L.

Canterbury.—The T.C. has decided to supply energy for illuminating purposes during the cricket week at 2½d. per unit.

Coventry.—The successful year's working of the electricity department formed the subject of hearty congratulation at the last meeting of the T.C., when the report submitted showed a net profit of £5,647. Alderman West, chairman of the committee, in moving the adoption of this report, remarked that the average price obtained for energy in Coventry was 1½d. per unit, and in spite of the cost of coal being 3s. per ton more, they had been able to show an excellent result. The increased cost of coal accounted for £2,233 of the larger costs of working. But for this rise their station costs would have been brought down to ·63d. per unit. Councillor Bettmann urged that there was a great necessity for a substantial reserve fund to be built up, and Councillor Pridmore, replying, said that this at present amounted to £1,700. With regard to the extensions to distributing plant, amounting to £35,000, for which the sanction of the L.G.B. is being sought, Ald. West assured the Council that this money would only be spent as the demand warranted it. The Council sanctioned a thousand pounds of the net profits being handed over to the relief of the rates.

Darlington.—The T.C. has received from the L.G.B. sanction to a loan of £1,030 for the provision of a new boiler and superheater at the electricity works.

Dorking.—With regard to the application of the U.D.C. for a loan of £11,600 to cover the balance of expenditure on the E.L. undertaking, the L.G.B. has sanctioned a sum of £10,120, and disallowed £1,374. Of this, £683 is for the cost of the engineer's house, £468 overcharges on meters, and £92 overcharges on house services.

Dover.—The T.C. has received from the L.G.B. sanction to a loan of £9,774 for E.L. purposes.

A further loan of £1,000 for free wiring has been applied for.

Dundee.—Quite a sensation was caused in electrical circles in Dundee last week by the announcement that the Corporation undertaking was threatened by the inroads of a private company. The facts, it is gathered, are as follows:—A company with a capital of £200,000, which has its headquarters in the West of Scotland, issued a circular to power users intimating its readiness to supply energy in Dundee. It is proposed to generate electricity in a district near coal pits, to obtain wayleaves for the distribution from the railway companies and to supply local authorities, mill owners, colliery owners, &c., at a rate of not more than ½d. per unit. It is stated that the preliminary notes for the prospectus of such a company are already in existence, as also are the heads of the proposed agreement between the company and the North British and Caledonian Railway Companies. The company states that it is acting under the best legal advice, and is entitled to generate energy and convey it along railway wayleaves and supply all works which it can get at from the railways without any Parliamentary sanction.

At a meeting of the Dundee Finance Committee the situation was discussed. The town clerk stated that the position was that Dundee had Parliamentary powers to supply electricity within a certain area, and that any other statutory company seeking similar powers would require to intimate its intention to the municipality which would have the fullest powers of opposition. The new company, however, proposed to ask no Parliamentary sanction, and thus no opportunity would be given of opposing them. It would not have power to carry cables under the streets, but it claimed that it had the right to transmit energy by overhead cables, for the erection of which the consent of the local authority was not necessary. In the course of an informal talk, doubt was expressed as to the powers of the railway companies to permit electrical transmission along their routes, and also as to the rights of a private company to invade districts at present served by municipalities, without the sanction of a provisional order.

Egypt.—An electric lighting plant is to be installed at Giza, to light the schools, and for the instruction of the engineering students.

Epsom.—We regret that through an oversight a note referring to Dorking appeared under this head last week.

Hayward's Heath (Sussex).—The U.D.C. has received notice that a prov. order for E.L. will be applied for by the Hayward's Heath and District Electric Supply Co.

Hull.—In connection with the Corporation Electricity Undertaking, Councillor Costello, a member of the Committee, has been pressing for accounts showing the working of the undertaking.

These figures were presented at a meeting over which the chairman of the Committee, Councillor Hanger, J.P., presided. The chairman pointed out that there was a substantial profit, despite the fact that there had been extensive renewals carried out during the year. This work had been in connection with the mains and the switchboards in order to bring the earlier portions of the undertaking up to date.

Alderman Brown and other members of the Committee congratulated the chairman and the engineer (Mr. Bell) on the satisfactory nature of the accounts, but Mr. Costello insisted upon his vote being recorded against the accounts.

The T.C. has been asked for terms for supplying energy to the new works of Messrs. Reckitt & Sons, Ltd., on an approximate yearly consumption of 360,000 units.

Kendal.—The T.C. has decided to apply for a loan of £10,000 for the erection of an electricity station in conjunction with a refuse destructor, motors and distributing mains, &c.

Leyton.—The District Council has had under consideration the charges for energy, and in this connection has received a letter from the local Ratepayers' Association, urging a reduction in the price and the need for the partial or entire abolition of meter rents. In the result it has been decided to adjourn consideration of any revision in the charges for six months, but meter rents are to be reduced from 1s. 6d. to 1s. per quarter. With regard to a suggestion that the Council should make fuller use of its powers with regard to the sale or letting for hire of motors, it does not consider the demand is sufficient to justify the expense.

London.—Hampstead.—The experiment of using a Berry series gear in one of the sub-stations having proved successful, the Council at the last meeting decided to fix similar equipment in all the other sub-stations, and also a number of new transformers, the whole to cost £688. Only a small quantity of water has been obtained from the artesian well at the generating station, sunk some years ago at a cost of £1,100, and at present £1,000 per annum is paid for water supplied. Messrs. Isler & Co. have made what Ald. Pritchard, chairman of the Electricity Committee, called a sporting offer—viz., to endeavour to obtain a supply of water from the well by a process of their own; if they obtain 2,000 gallons per hour they will receive £321 10s.; if 4,000 gallons, £521 10s.; but if they are unsuccessful, only £36 10s. is to be paid to them. This offer was accepted.

Bermondsey.—The B.C. has resolved to send a communication to the Government protesting against the action of the B. of T. in allowing the private auditors of electric undertakings to also audit the accounts on behalf of that Board. All borough councils having electric undertakings are to be asked to take similar action.

Margam.—The B. of T. has revoked the 1898 E.L. order.

Otley.—Once more the subject of electric light in the town is receiving attention, Messrs. Marshead, Preece and Mountain having requested permission to lay a suitable scheme before the Council.

Rochdale.—In response to an application from the Littleborough D.C., the T.C. has resolved, subject to satisfactory details being arranged, to give a supply of electricity in bulk to the District Council at the Corporation sub-station. The Electricity Committee of the T.C. has agreed to order that the necessary service be laid to supply the Lancashire and Yorkshire Railway Co. with electric lighting and power at the Castleton stores.

Sheffield.—Some time ago the E.L. department was desirous of borrowing £250,000, but the Finance Committee refused consent until steps had been taken to ascertain the position of the undertaking financially and commercially. Towards this end, Sir Alex. Kennedy was approached, and the result of his investigation has now been made public. A report submitted by a sub-committee shows that the Corporation bought out the original company for sums totalling £299,324, of which some £143,686 was unrepresented by any tangible asset, and can only be regarded as goodwill. In addition to the above sum, some £51,554 represents obsolete plant taken over, and, taking everything into account, the sub-committee concludes that at least £202,996 of the amount spent in acquiring the undertaking is not now productive capital. The sub-committee considers it advisable to distinguish between non-productive and productive capital, and the latter is given as £175,723. The undertaking has been able to set aside a surplus of £28,529, from which £10,000 was allocated to a renewals fund. The Sub-Committee recommends that a further £10,000 of the surplus should be placed to renewals, also that £5,000 per annum during the next five years should be added to the same fund out of profits, and that a reserve fund should be accummulated up to the statutory limit. Sir Alexander's report discusses the question of shutting down the Sheaf Street works, and concentrating the plant at Neepsend, with a view to decreasing the production costs, but comes to the conclusion that this would be impracticable; he also concludes that neither the working costs nor the price of supply to power consumers can be much further reduced as things are at present.

The T.C. has applied for a loan of £11,000 for extensions at the Neepsend generating station.

South Africa.—According to the *Financial News*, a representative of Messrs. Beardmore is negotiating with a view to establishing at Johannesburg a new electrical works which will enter into competition with the Victoria Falls Power Co. It is added that the new concern will have the support of Messrs. Eckstein.

South Shields.—The annual report issued by Mr. J. H. Cawthra, borough electrical engineer, shows a net profit on the electricity undertaking for the last financial year of £1,359, which, together with the net profit from Holborn Quay of £44, makes a total of £1,403. The Committee has decided to place the whole of the available balance to the reserve fund, bringing the latter up to £8,782.

Southgate.—The U.D.C. has received a letter from Messrs. Foote & Milne, giving notice of their intention to apply to the B. of T. for a prov. order for electric lighting. At the last meeting of the Council, the General Purposes Committee reported that it had under consideration two schemes for electric lighting, one for taking electricity in bulk from the North Metropolitan Co., and distributing same in the district, and the other a proposal by the company for the transfer to itself of the Council's electric lighting order under certain conditions to be agreed upon. The Committee announced that at present it was unable to make any recommendation.

Southwick.—The E.L. Joint Committee of the Shoreham, Southwick and Portslade U.D.C.'s has agreed to drop the matter of electric supply for the present, in view of the fact that the Brighton Corporation required the matter of price to be left to its discretion.

Stroud (Glos.).—The B. of T. has informed the U.D.C. that the Stroud, Nailsworth and Dursley E.L. Order, 1904, has been revoked.

Walton-on-the-Naze.—Mr. H. R. Spence, of the Coast Development Co., has informed the U.D.C. that he intends applying to the B. of T. for a prov. order for E.L.

Warrington.—The borough electrical engineer in his annual report states that the gross revenue amounted to £17,234 and working expenses £9,701; balance, £7,533. There has been paid £5,532 as interest on loans and contribution to sinking fund, leaving a net profit of £2,213 for the year's working, a decrease of £303 as compared with the previous year. This decrease is almost wholly accounted for by the increased price of coal.

Widnes.—The T.C. has reduced the price of gas to 1s. 2d. per 1,000 cb. ft., and if it is used for motive power to 10d. This is said to be a world's record. The cost to manufacture and distribute the gas is stated to be 1s. 0½d. per thousand. A correspondent suggests that competition with gas in Widnes would be somewhat unhealthy.

Willesden.—The statement of accounts of the electricity undertaking of the U.D.C. for the year ended March 31st, 1908, shows a gross profit for the year of £8,198, and a net profit of £725, the actual surplus on the electricity fund (after allowing for deficiency in previous years) being £182. The Electricity Committee has decided that £337 be written off as irrecoverable, including actual bad debts amounting to £259, and £32 for provision in respect of outstanding accounts. The B. of T. has consented to the Council altering the system of supply from direct to alternating current in part of the area of supply. Consideration of a communication as to the charges for arc lighting to private consumers has been deferred until after the completion of negotiations with the North Metropolitan Electric Power Supply Co. with regard to a reduction in the prices charged for bulk supply.

Worcester.—The accounts of the Corporation electricity undertaking for 15 months, show that on the net revenue account there is a net profit of £1,694 12s., carried to the appropriation account. The latter account shows that £192 of this sum went to clear off the deficit carried forward from 1906, and £1,149 11s. was applied to items of capital expenditure, leaving an unappropriated surplus of £352 19s. In an explanatory report Mr. C. M. Shaw, the engineer, states that the total revenue showed receipts amounting to £20,775. The total works costs were £8,626, leaving a gross profit of £12,149.

Wrexham.—The T.C. has adopted a new system of tariff for the supply of energy to houses—viz., an annual charge equivalent to 12½ per cent. of the rateable value, plus 1½d. per unit for current used, less ¼d. per unit on payment of accounts within one month.

TRAMWAY and RAILWAY NOTES.

Cardiff.—Alderman Carey, the Chairman of the Tramways and Electric Lighting Committee, at a meeting on Tuesday, showed how Cardiff was handicapped as compared with other towns by the heavy loan charges on its tramways and electric lighting. Between £5,000 and £6,000 was paid every year out of profits for loan charges on the sum of £96,822 paid to the old company for the undertaking. Loan charges last year, amounting to over £45,000, absorbed 40 per cent. of the total receipts. Three depôts, costing £23,500, had to be taken over, and these had been lying idle ever since. The capital expenditure had been reduced by no less than £141,443. Last year, the best since the inception of the tramways, showed an increased profit of £4,400.

Bournemouth.—At the meeting of the Corporation on the 7th inst. the annual report of the working of the tramways was

presented, showing that nearly 14,000,000 passengers were carried —an increase on the previous year of about 500,000. The receipts were nearly £36,000, an increase of £2,400; while the expenditure was nearly £53,000, leaving a gross balance of £33,000. The net loss was £384, after providing for interest on capital, contributions to stock redemption fund, and rent of leased lines, &c.

Croydon.—The Whitehorse Road section of the Corporation tramways was closed for traffic on Sunday last, owing to the continued heavy loss entailed in working the line, which competes to a large extent with older routes. It was constructed at a cost of £8,124 shortly after the B.C. took over the management.

Dudley.—At last the Tramways Purchase Agreement has been completed, and for something over £71,000 the Corporation is to become possessed of the tramways within the borough, and to lease them to the vendors, the British Electric Traction Co., for 21 years. This arrangement will give the T.C. full control of the roads traversed by the tramways and light railways in the borough, and place it in a superior position with regard to whatever developments may arise in the future. It is not, however, expected that the Corporation will be great pecuniary gainers by this deal, which has taken four years of expensive negotiations and litigation to complete.

Dundee.—The deputation which visited the Continent to examine the trackless trolley system of tramway traction, with a view to its adoption in the outskirts of the city, has returned with a high opinion of the system. It is believed it will be able to convince the Council of the wisdom of adopting this method of traction. Meantime the question is left open until the manager has prepared his report.

Hull.—Tramway fares at a ½d. commenced here on Wednesday for the whole of the tramway routes of the city, some of which extend for three miles. The ½d. whole route fare will be from five to nine o'clock in the morning. Over 9,000 passengers travel on the Hull cars each day between these hours.

Leeds.—A very useful arrangement has been introduced on to the tramways. The engineer has fitted the framework of a trolley-car with two tip-wagons, each of a capacity of 4 tons. The trolley standard comes between the wagons, and there is the usual platform and driving mechanism at each end. The wagons will tip towards either side and throw clear of the rails, and they can be readily removed if the car has to be used for any other purpose.

Leicester.—The T.C. has adopted a report of the Tramways Committee, which recommended the supply of electricity to power consumers upon the following terms:—(*a*) A sum of 15s. a quarter for every horse-power in respect of the maximum horse-power demanded by the consumer to be paid as a basic charge, and, in addition (*b*) a sum of ¾d. for every B. of T. unit of electricity supplied. The Committee also recommended a scale of discount upon the units consumed ranging from 10 to 15 per cent., according to the load factor in each case. The chairman of the Gas and E.L. Committee protested against the tramways department supplying energy for lighting.

Liverpool.—A lengthy discussion took place at the City Council on July 1st on a proposal to pay £200 each to the town clerk and deputy town clerk, and £100 to another official, for extra work in connection with the claims department of the Corporation tramways. Hitherto the Tramways Committee has been paying the Ocean Accident and Guarantee Corporation £12,000 annually, and has also contributed £4,000 a year in the way of expenses, to insure itself against what are known as third-party risks. Believing this sum to be unnecessarily large, it has come to the conclusion, based upon the experience of many other large municipalities, that a considerable proportion of this money would be saved if it undertook the work, instead of transferring it to an insurance company. Hence the decision to try the experiment for 12 months. The scheme was warmly opposed and defended, and ultimately by a non-party vote was approved by 48 votes to 37.

London.—A report was laid before the L.C.C. on Tuesday recommending the reconstruction on the conduit system of the tramways from Euston Road, *via* Camden Road, to Holloway Road, with a capital estimate of £118,560. The Highways Committee reports that in the tramway capital estimates for this year sums amounting to £168,810 are included for the reconstruction of these lines and of the lines from the "Britannia" to Hampstead Heath. These figures are based on the adoption of the G.B. surface-contact system of traction. In view, however, of the fact that the working of the lines reconstructed on that system from Whitechapel to Bow Bridge has only just been commenced, sufficient experience will not be available for some time to enable the Committee to decide whether it can recommend the adoption of that system.

The work was commenced on Saturday of electrifying the tramway line from Denmark Hill to Brixton Road, along Coldharbour Lane, which is almost the last of the South London horsed car lines to cease running. It is expected to be completed in about three months.

Oldbury.—The B. of T. has published the report of Lieut.-Col. H. A. Yorke on the accident on February 20th, near Oldbury, on a tramway belonging to the Birmingham and Midland Tramways Co., the conductor and one passenger receiving fatal injuries and eight passengers being hurt. The accident is attributed to the breaking of the left-hand trailing wheel of the car in passing through some points. The wheel was first brought into use in December, 1906, since which date it was said to have travelled 25,500 miles.

Portsmouth.—An important scheme for connecting Portsmouth with Hayling Island by means of an electrical light railway, which has for some time been under consideration, has been advanced materially by the acceptance of the contract of William Kennedy, Ltd., of Partick, Glasgow, to carry out the work. The line must cross Langstone Harbour, near the eastern-most extremity of the Portsmouth defences at Fort Cumberland, and the scheme includes the erection of a transporter bridge similar to that at Newport, Mon., worked from overhead by electric power at a sufficient height to allow of warships entering the harbour whenever necessary.

Rochdale.—It has been suggested that there should be through running of cars between Rochdale and Bury. At present passengers have to change at Heywood. The Bury Corporation is sanguine that through running would increase the traffic receipts.

South Africa.—An electric tramway is to be constructed at Boksburg, Transvaal.

TELEGRAPH and TELEPHONE NOTES.

Cables and Trawlers.—The Postmaster-General has appointed a small committee to inquire whether injury is caused to submarine cables by the operations of trawlers; and, if so, to consider and report what steps it is desirable and practicable to take to prevent such injury. The Chairman is Sir J. C. Lamb, C.B., C.M.G. Mr. F. J. Brown, of the Secretary's Office, General Post Office, will act as secretary, and persons desiring to offer evidence should apply to him. Sir J. C. Lamb was formerly Second Secretary to the Post Office, and is a director of the West India and Panama Telegraph Co.

New Telautograph.—It is reported in the daily Press that a new telautograph has been devised by a German named Grzanna, in which the record is made on sensitised paper by means of two mirrors pivoted at right angles to one another.

Paris Telephones.—The dissatisfied subscribers to the Paris telephone system recently found a new way to vent their wrath—by calling up the Under-Secretary of State for Posts and Telegraphs. The consequence was that the Minister's telephone was continuously at work, until in desperation, after 1,300 calls had been recorded, the number was changed and revealed only to a limited circle.

Roumania.—During the year 1905 the number of telegrams handled was 1,975,429, of which 1,658,431 were private messages, 168,169 official and 148,829 service messages. The international traffic increased to 576,666 telegrams, of which 291,574 were sent and 285,092 received. During 1904 the greatest number of telegrams was exchanged with Austria and Hungary—viz., 171,860. The telephone service in 1905 was represented by 25,028 km. of line and 36,915 km. of wire, with 6,626 offices. Receipts from the telephone service increased from £16,398 in 1901 to £27,515 in 1905; the expenses for the same period decreased from £13,923 to £12,838.—*Journal Télégraphique.*

Telegraphic Interruptions and Repairs:—

Cables.	Interrupted.	Repaired.
Curacao-Coro Curacao-La Guayra Curacao-Maracaibo } Closed	Jan. 12, 1906 ..	..
Tarifa-Tangier	Jan. 18, 1904 ..	..
Port Arthur-Chifu (Closed)	Mar. 9, 1904 ..	..
Las Palmas—Arrecife	May 18, 1908 ..	..
Cayenne-Salinas	May 9, 1908 ..	..
Pera-Dardanelles	May 20, 1908 ..	..
Sierra Leone-Accra	May 28, 1908 ..	..
Cadiz-Tangier	June 8, 1908 ..	..

Wireless Telegraphy.—A chess match took place by wireless telegraphy between passengers in the *Campania* and the *Oceanic*, during a recent eastward passage; the match lasted for over two days, and ended in a draw.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Adelaide.—August 26th. The Postmaster-General requires tenders for 9 tons hard-drawn copper wire, 200 lb. per mile; specification No. 3; 3,000 copper tapes for 200-lb. wire, and No. 5 insulators, as per specification No. 195, to be packed in bundles of 100 each; 3,000 copper binders for 200-lb. wire and No. 5 insulators, as per specification No. 195, to be packed in bundles of 100 each; and 3,000 No. 5 insulators. Specifications may be inspected at this office.

BRISBANE.—August 24th. The Postmaster-General requires tenders for iron, copper and covered wires, as per schedule 55, insulators, as per schedule 54, and ironwork, as per schedule 53.

Belgium.—August 11th. The municipal authorities of Louvain are inviting tenders for the concession for the supply of electrical energy for public and private lighting and power purposes in the town. Full particulars can be obtained from Le Directeur de l'Usine de Paz, while tenders are to be sent to Le Collège des Bourgmestre et Echevins de la Ville de Louvain.

BRUSSELS.—The Société des Chemins de fer Vicinaux, 14, Rue de la Science, require tenders for the supply and laying of underground cables and return rails on the Namur suburban electric lines. Details are available by application to the Directeur-General at the above address.

Bethlehem (O.R.C.).—July 15th. The liquidator of Harris, Lee & Co., Ltd., is inviting tenders for the purchase as a going concern of the concession for the supply of electricity in Bethlehem, O.R.C, with engines, buildings, poles, wires, tools, &c. See "Official Notices" July 3rd.

Burnley.—The T.C. has approved of the purchase by the Electricity Committee of a 750-KW. generating set at a price not exceeding £6,000.

Dublin.—July 13th. Sub-station switchboards, transformers and accessories, for the Corporation. See "Official Notices" June 26th.

July 13th.—Boiler plant for the Pigeon House generating station for the Corporation. See "Official Notices" June 26th.

Felixstowe.—July 15th. Overhead lines and services for the U.D.C. See "Official Notices" July 3rd.

Germany.—Tenders are about to be invited by the municipal authorities of Listernohl (Westphalia) for the establishment of a central electric lighting station in the town, at an estimated cost of £21,000.

Gillingham.—July 17th. E.L. installation for schools for the Education Committee. See "Official Notices" July 3rd.

Ipswich.—July 22nd. Rubber-insulated wires, paper-insulated cables, and copper trolley wire for the Corporation. See "Official Notices" to-day.

London.—July 21st. Six electrically-propelled stores transport vehicles for the L.C.C. Tramways Department. See "Official Notices" July 3rd.

ISLINGTON.—July 16th. Cooling tower for the Lighting Committee. See "Official Notices" June 26th.

ST. PANCRAS.—July 13th. Low-tension switchboard additions at King's Road generating station, for the B.C. See "Official Notices" June 26th.

Manchester.—Electric wiring of the Electrical Exhibition Buildings. Only contractors who are exhibitors can tender. See "Official Notices" to-day.

Portsmouth.—July 20th. Coal for the Tramways Committee. See "Official Notices" to-day.

Rainhill.—July 23rd. Electrically-driven plunger pump for the County Asylum. See "Official Notices" to-day.

Rotherham.—July 13th. Electricity meters for the Corporation. See "Official Notices" to-day.

Russia.—September 14th. The Town Clerk of Odessa (Upiawa) will receive tenders for a concession to erect and work a power and lighting supply. A central station of a minimum of 6,000 H.P. is to be erected and equipped.

Spain.—July 28th. The Spanish Post and Telegraph authorities in Madrid are inviting tenders for the supply of 8,000 metres of telephone cable. Tenders are to be sent to La Direccion General de Correos y Telegrafos, Carretas 10, Madrid, whence particulars may be obtained.

CLOSED.

Australia.—BRISBANE.—Postmaster-General :—

3,844 yd. 208-pair lead-covered cable, at £490 per mile; 320 yd. 78-pair lead-covered cable, at £240 per mile; 858 yd. 39-pair lead-covered cable, at £140 per mile; 652 yd. 26-pair lead-covered cable, at £115 per mile.—British Insulated & Helsby Cables, Ltd.

3,492 yd. 104-pair lead-covered cable, at £465.—Western Electric Co.

5,280 yd. 52-pair lead-covered cable, at £176 per mile.—W. T. Henley's Telegraph Works, Ltd.

220 yd. 13-pair lead-covered cable, at £74 per mile.—C. E. Bernays, Brisbane.

MELBOURNE.—Postmaster-General of Victoria :—

20 miles of telephone cable, paper-insulated lead-covered, £490 per mile; 150,000 paper sleeves, 2s. 6d. per 1,000.—Western Electric Co.

30 metallic circuit telephone switchboards (100 lines), £45 18s. 7d. each, £1,377 17s. 6d.—R. B. Hungerford.

Barrow.—The Electricity Committee has accepted the tender of Mr. R. Balfour, Barrow, for coal, for nine months, at 12s. 3d. per ton.

Burnley.—At the T.C. meeting on July 2nd it was explained that the Klein Engineering Co., whose tender had been accepted for the erection of a cooling tower at the electricity works, had gone into liquidation, and, with the consent of the company, Messrs. Riley, Ltd., of Fleetwood, would supply the tower for £123 10s. (£6 10s. less than the other).

Canterbury.—The T.C. has accepted the tender of Messrs. Philpot & Son, St. George's Street, Canterbury, for wiring the Corn Exchange, Guildhall, Beaney Institute and Westgate Towers, for outside illuminations during the cricket week. The Council has also appointed the firm to carry out electrical work for the Corporation for the next half-year.

Castleton (Lancs.).—The British Westinghouse Co., Ltd., have received an order from Messrs. Tweedales & Smalley, Castleton, for one of their latest type tandem vertical gas engines, to be direct coupled to a direct-current generator of a capacity of 500 KW. when running at 110 volts, with switchboard complete, forming an extension to the 235-KW. gas engine sets recently put into operation.

Felixstowe.—The U.D.C. has accepted the tender of Messrs. Davey, Paxman & Co., Ltd., for a boiler, engine and compressors, at £1,000.

Foleshill.—The R.D.C. has accepted the tender of the Electric Trades Supply, Ltd., Birmingham, for the electric light installation at the Isolation Hospital, at £243.

Leyton.—The U.D.C. has accepted the following tender of Messrs. Venner & Co. for ordinary meters for the electrical department for the year ending June 30th, 1909 :—

Size 1½ ..	£1 13 0	Size 10 ..	£2 5 0	Size 50 ..	£2 14 0
,, 3 ..	1 16 0	,, 18 ..	—	,, 75 ..	—
,, 5 ..	2 0 0	,, 25 ..	2 10 0	,, 100 ..	3 3 0

These prices are the same as those accepted last year, and similar prices were quoted this year by Ferranti, Ltd. (who also quoted £2 10s. for size 18 and £3 3s. for size 75), and the British Thomson-Houston Co. The latter firm did not, however, quote for sizes 25, 50, 75 and 100. Like Messrs. Ferranti, they quoted £2 10s. for size 18.

The D.C. has accepted the tender of Myers, Rose & Co., Ltd., for the annual supply of hand-picked small hard steam coal (Linby, Newstead and Annesley), at 16s. 5½d. per ton respectively, with the option to the Council to take a supply of slack, in addition to or in lieu thereof, if considered desirable by the electrical engineer at any time for use with the mechanical stoker, such slack to be supplied at the following prices :—Bolsover nutty, 12s. 11d.; Creswell nutty, 12s. 11d.; Mansfield nutty, 11s. 10d.; Bentick, 12s. 7d.; West Hallam, 11s. 8d.; Shipley, 10s. 11d.; and Cossall, 11s. 8d.

London.—HORNSEY.—The Education Committee has accepted the tender of Mr. F. Cottrell, at £179, for installing electric light at North Harringay Schools.

BATTERSEA.—The B.C. Lighting Committee has decided to accept the tender of Babcock & Wilcox, Ltd., at £220, for work in connection with the re-arrangement of the electricity works boiler house steam range.

ISLINGTON.—Necessary repairs to an artesian well pump at the B.C.'s electricity works are to be carried out by the New Calyx Drill and Boring Co., at £88 11s.

Salford.—The T.C. has accepted the tender of W. T. Henley's Telegraph Works Co., Ltd., for single rubber-covered cable for a year.

Willesden.—The U.D.C. Electricity Committee has resolved to accept the tender of the British Westinghouse Co. for the supply of converting plant.

York.—The T.C. has accepted the tender of Callender's Cable & Construction Co., Ltd., for the supply of cable to go across the River Ouse, at £335.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERDARE.—Two villas in Abernant Road, for Jones & Williams; T. Roderick, architect, Clifton Street, Aberdare. New schoolroom (accom. 200) at Baptist Chapel, Carnarvon; J. L. Smith, architect, Aberdare.

ABERDEENSHIRE.—Additions to Stonewall (estate of Troup); Burnett and Reid, 12, Golden Square, Aberdeen. House at Brakley, for J. Mennie. J. Cobham, architect, Haddon House, Aberdeen.

ACCRINGTON.—Church of St. Augustine, Huncoat.

ALDERSHOT.—House, Southmead Road, Crown Estate, for Miss Lines; workshop, Elms Road, for Clarence Sounes.

ALFRETON.—Alterations to Stonebroom Schools, for the Sherland and Higham School Managers (£800).

ALSAGER.—Sewage Works extensions. District Council.

APPLEDORE (DEVON).—Manse for the Congregational Church; J. J. Smith, architect, Bridgeland Street, Bideford. Council School at Northam; County Architect (Education), Richmond Road, Exeter.

ARDGAY.—New U.F. Church for the Kincardine (Ross) congregation.

ASHTON-UNDER-LYNE.—Alterations to the Cookery and Laundry Centre, Mechanics' Institute, for the T.C. Burton & Percival, architects, 150A, Stamford Street, Ashton-under-Lyne.

AUDLEY (STAFFS.).—Schools at Butt Lane (£8,970). J. Gallimore, builder, Newcastle-under-Lyme.

BARNSLEY.—Y.M.C.A. premises in Eldon Street; E. W. Dyson, architect, 10, Regent Street, Barnsley. Pair of villas, Kensington Road; L. Dowton, architect, 44, Theobalds Road, London, W.C.

BARNSLEY (WOMBWELL).—House, shop and stable, near The Halfway House. J. Robinson, surveyor, Park Cottage, Wombwell.

BARRY DOCK.—New Police Station at Cadoxton. T. M. Franklen, Clerk to Glamorgan County Council, Cardiff.

BEAUMARIS.—Village Hall at Llangoed. Frank Bellis, architect, Bangor.

BEXLEY HEATH.—House, Hawthorne Road, for W. O. Penseney.

BERKHAMSTED.—Roman Catholic Church. H. and J. Matthews, builders, Berkhamsted.

BIRMINGHAM (KING'S HEATH).—Sunday schools and parish room in connection with All Saints' Church (£4,000).

BLACKBURN.—Houses, Cornelian Street, for W. Pickersgill; Higher Croft Road, for the National Free Homes Association, Ltd.; Alexander Road, for Mrs. Nuttall; Cedar Street, for Geo. Parkinson; Livingstone Road, for J. A. Dugdale; business premises, Northgate and Town Hall Street, for the Co-operative Society.

Additions to Accrington Road schools. Knowles & Whittaker, builders, Blackburn.

New central premises for the Co-operative Society. Simpson and Duckworth, architects, Richmond Chambers, Blackburn.

BLACKPOOL.—Houses, Peddar's Lane, for Thos. Hill; Highfield Road, for J. L. Ogden; Cunliffe Road, for J. Cunliffe; Portland Park Estate, for Morrison & Roebuck; Portland Park Estate, for John Whiteside; Lytham Road, for Mrs. S. Rivett; Palatine Road, for A. J. Haworth; Portland Park Estate, for Henry N. Rose; Warley Road, for John Crabtree; Mere Road, for Parker Bros.; Portland Park Estate, for Fred. Greenwood; Claremont Avenue, for John Fish; Whitegate Drive, for Geo. Fredk. Clark; Bank Road, for John Gregson; showrooms, New Road, for Wm. Holmes.

New Infants' schools at Reval and Devonshire Road. Director of Education, Blackpool.

New police station at Hawes Side for the T.C. J. S. Brodie, borough surveyor.

BLAENCLYDACH (GLAM.).—Renovation of the Parish Church of St. Thomas, Clydach Vale. J. W. Rodger, architect, 14, High Street, Cardiff.

BOLTON.—Addition to works, Nelson Square, R. Hough; addition to timber store, Booth Street, W. Burrow; 12 houses, Brandwood Street W. and J. Leigh; alterations to premises in Deansgate for R. Whitehead & Sons, Ltd., fur dealers; new Girls' Holiday Home, for the Girls' Recreation Club, Bolton.

BOSTON.—Primitive Methodist Church at Skeldgate (£800).

BOURNEMOUTH.—Post office in Up Street. H. Barrow, contractor, Bournemouth.

BOYNDIE (BANFFSHIRE).—Additions to public school, Whitehills. A. Still, clerk to board, Boyndie.

BRADFORD.—Rebuilding block of offices in Brook and Booth Streets. R. Armistead, 8, Charles Street, Bradford.

BREDBURY (near STOCKPORT).—Houses, Osborne Street, for A. Moore; extension of engineering works, for Briddon & Fowler; extension of dye works, for J. Schofield & Sons.

BRENTFORD.—Parsonage (£2,000). P. A. Robson, architect, 9, Bridge Street, S.W.; Dorey & Co., builders, Brentford.

BRIDGWATER.—Probable re-erection of premises (after fire) for F. Snell, art wicker worker.

BRIGHTON.—Installation of the electric light at Elm Grove School for the Education Committee. T. Simpson & Sons, surveyors, 17, Ship Street, Brighton.

Day Training College. Brighton Education Committee.

BRISTOL.—Mission Room at Upper Horfield in connection with Horfield Parish Church.

Alterations and additions to the United Methodist Chapel, Winterbourne. La Trobe & Weston, architects, 44, Corn Street, Bristol.

BROMSGROVE.—Secondary School (£6,500).

BURNHAM (near MAIDENHEAD).—House, for F. W. Cleare.

BURNLEY.—New Roman Catholic Church, Ivy Street (£4,000), Rev. Father Shine; parochial building, Belvedere Road, for St. Catherine's Church; new place of worship, corner of Bright Street and Waterbarn Street, for the Trustees of Immanuel Baptist Church.

BURTON-ON-TRENT.—New Anslow Council Schools (£1,734). Geo. Hodges, builder, Burton-on-Trent.

Council School (£1,725). R. Kershaw, builder, Burton-on-Trent.

BUXTON (TIDESWELL).—Works in Tideswell Dale for the Litton Mineral Co.

CARDIFF.—Alterations, Tredegarville Chapel; C. J. Ward, architect, Cardiff. Alterations, business premises, 2, St. Mary Street; Veall & Sant, architects, Cardiff. Six houses, Kimberley Road, for O. T. Rees; W. H. Scott, architect, Cardiff. Two houses, Allensbank Road, for H. Nibblett; Veall & Sant, architects, Cardiff. Two houses, Llanishen Street, for H. Coffin; Veall & Sant, architects, Cardiff.

(PENGAM).—Infectious Diseases Hospital for the Gelligaer and Rhigos R.D.C. P. V. Jones, architect, Hengoed, Cardiff.

CARSHALTON.—Four houses in Fairview Road. Windebank & Co., builders, Hillcroombe Road, Sutton.

CASTLE HEDINGHAM (ESSEX).—New Parish Hall.

CHADWELL HEATH (ESSEX).—Additions to Isolation Hospital. H. Shaw, surveyor, Town Hall, Ilford, Essex.

CHATHAM.—Proposed new Drapery premises. Chatham Co-operative Society.

CHESHUNT.—New Schools for the C.C. (£4,542). Clark & Son, builders, Goddesdone Road, Cambridge.

CHORLEY.—Mission room. Rev. G. Northridge, vicar of St. George's.

CLACKTON-ON-SEA.—Bungalows, King's Cliff Estate; Mr. Sinfield, builder. Houses, Holland Road, for Miss L. Harold; Cemetery Road, for Mrs. E. M. Simmons.

CLEATOR MOOR.—Houses for W. Colebank and Rev. J. W. Stewart.

CLIFTON (near MANCHESTER).—Important developments at Newtown Collieries. Kearsley Coal Co.

COLCHESTER.—New church at Elmstead (£1,000).

COLWILL (ISLE OF WIGHT).—Baptist Church.

COLYTON (DEVON).—Rebuilding agricultural buildings at Schiel Barton, Southleigh. Mr. Stevenson, architect, 1, Jubilee Villas, Seaton.

CORBY.—Proposed new offices for Lloyd's Ironstone Co.

COTON (STAFFS.).—Enlargement and improvement of Cauldon Lowe Council School.

COVENTRY.—Houses, St. George's Road, for Herbert & Bass; Broomfie Road and Kensington Road, for W. Higgins; Westwood Road, for C. Blockley; St. George's Road, for the executors of Geo. Storer; Binley Road, for H. Tatlow; Marlborough Road, for R. A. Brown; Richmond Street, for W. Wincott, builder; Spencer Avenue, for J. W. Newcombe; Broomfield Road, for E. Twigg, jun.; Spencer Avenue, for H. Mander, jun., 75, Spon End; Webster Street, for E. Broad; St. George's Road, for H. B. W. Lowe; Lythall's Lane, for E. Harris, Cope Street; Albany Road, for Mr. Hubbard; Spencer Avenue, for Hallam and Co., New Street; Cross Road, for T. Randle; additions to Witton Lodge, for R. A. Rotherham; extensions, Stoney Stanton Road, for the Coventry and Warwickshire Hospital Committee; extensions to the Ragged School for the trustees.

CREWE.—Two houses in Remer Street for H. Brenchley; three houses in Stewart Street for H. Mingay; alterations to shops in Coppenhall Terrace for L. & N.W.R. Co.

DARLINGTON.—Houses, Millbank Road, Kitching & Lee, architects, Darlington; Walton Street, for G. Dickinson & Son; Clifton Terrace, for Chas. Ross.

DATCHET.—House, Buccleuch Road, for J. Pearce.

DEVONPORT.—Proposed new school at Camel's Head (accommodate 1,000).

DEWSBURY.—Houses, Clarke Street, for S. Coop & Son; conversion of Manor House into three houses, for W. Whittingham; houses, Leeds Road; Kirk & Sons, architects, Dewsbury.

DINAS (RHONDDA).—Sixteen houses at Trealaw, for the Miskin Manor Building Club. Evans, Williams & Evans, architects, Pontypridd.

DOVER.—Residence at Temple Ewell. Worsfold & Hayward, architects, Dover.

DUFFTOWN.—New operating room and other additions to Cottage Hospital. J. Wittet, architect, Elgin.

DUNBLANE.—Library and reading room (£2,300). Secretary, Library Committee, Dunblane, Perthshire.

DUNDEE.—Additions to Royal Infirmary at Barrack Road. Secretary, Royal Infirmary, Dundee.

EASTBOURNE.—Six houses, Archery Road, for J. C. Lacey; additions to St. Margaret's, Milnthorpe Road, for Miss Tidman; pavilion, East Dean Road, for the Downs Golf Club; additions to 133, Seaside, for the L. & S.W. Banking Co.; detached house, Rowsley Road, for B. Stevens; detached house, Buxton Road, for the Rev. C. P. Hutchinson.

Public convenience at the Redoubt (£730). A. E. Prescott, borough surveyor.

ECCLES.—Proposed elementary school in Beech Street, Winton. H. Lord, architect, 42, Deangate, Manchester.

Alterations and improvements at Sewage Works manager's house. T. Moore & Co. contractor, Eccles.

EGREMONT (BIRKENHEAD).—Extension of the pier and landing stage (£13,361). Alex. Findlay & Son, Ltd., contractors, Motherwell.

ELGIN.—Additions to farm of Windyedge, Marnoch. C. C. Doig, architect, Elgin.

ELTHAM.—Four houses, Glenhouse Road. J. J. Bassett, builder, Earlshall Road, Eltham.

ENFIELD.—Extension to Grammar School (£6,130); H. G. Crothall, architect to Middlesex Education Committee, Guildhall, Westminster, S.W.

ENNISCORTHY (CO. WEXFORD).—Parochial house for the Rev. R. Fitzhenry. T. F. Slevin & Sons, architect, 8, Leinster Street, Dublin.

FARNWORTH.—Extensions to Catholic Schools. J. Cooker, contractor, Walkden.

FERMOY (CO. CORK).—Artisans' and labourers' dwellings. D. J. Buckley, town surveyor of Fermoy, 55, South Mall, Cork.

FERRY HILL.—Alterations at Stargate and Cornforth Council Schools. F. E. Coates, Shire Hall, Durham.

FLEET (HANTS.).—New operating theatre at the Cottage Hospital.

FYVIE.—Alterations on estate of Netherdale. W. L. Duncan, architect, Turriff.

GAINSBOROUGH.—New Primitive Methodist Church at Coningham (£1,200).

GARFORTH (near LEEDS).—Villa residence, Church Lane, for Mr. Wordsworth.

GELLIGAER.—Twenty-four houses at Glyngaer for the Gelligaer Building Club. R. O. Dowdeswell, architect, Cardiff.

GERRARD'S CROSS (BUCKS.).—Additions to Highwood, for F. T. Husband; houses, for J. Langston; house, Bulstrode Way, for A. Taylor.

GILLINGHAM (KENT).—Residence for E. Crawley, estate agent. W. E. R. Randall, architect, 171, High Street, Chatham; S. L. Redford, builder, 6, Livingstone Road, Gillingham.

GLOSSOP.—Nurses' home and convalescent home (£6,000). Bulman and Willicomb, architects, London.

GORSEINON.—Extensive additions to the Steel Works of Baldwins, Ltd., Gowerton.

GOSPORT.—New schools, Grove Road (£7,474). E. J. Tench, architect, Norwich.

GRIMSBY.—Extensions to Welholm Road Primitive Methodist Church.

GREENHITHE (DARTFORD).—Wesleyan Church. S. W. Neighbour, architect, 9, Regent Street, S.W.

HAMSTALL RIDWARE (STAFFS.).—Proposed Council School. Staffordshire Education Committee.

HAVERFORDWEST.—Men's Institute at Rhos-on-Sea (£200).

HEBBURN-ON-TYNE.—Extensive works for the Bauxite Refining Co., aluminia manufacturers.

HIGH CLARENCE (CO. DURHAM).—New Council School (280 children). J. Garry, architect, 47, Church Street, West Hartlepool.

HITCHAM (near TAPLOW, BUCKS.).—Houses, for W. Horwood.

HORLEY (SURREY).—Additions to Salford Schools, for the C.C. (£1,177). Smith and Sons, builders, Croydon.

HORWICH.—Extensions to the Vale Mills for the Star Bleaching Co. E. W. Dyson, architect, 10, Regent Street, Barnsley.

HUCKNALL (NOTTS.).—New Salvation Army hall in High Street (£2,200).

HUDDERSFIELD.—Club premises at Skelmanthorpe and Lindley. J. Berry, architect, 3, Market Place, Huddersfield.

HULL.—Houses, Newland Park, for W. Smith; Ryde Street, for A. Williamson; Faraday Street, for W. Norman; Newland, for J. E. Mallison; Perth Street and Renfrew Street, for W. Barnett; New Street and Exmouth Street, for F. Neal; Anlaby Road, for J. W. Jordan; Portobello Street, for W. Sykes; Marlborough Avenue, for G. Kirkwood; Roxburgh Street, for J. Loncaster; Faraday Street, for C. W. Norman; additions to works, for the Premier Oil Co. and the British Oil and Cake Co., Eagle Oil Mills; warehouses, Withernsea Street, for Messrs. Chadwick; Hessle Road, for A. Vice.

Alterations at the George Hotel, Whitefriargate, for Ind, Coope and Co., Ltd. Abbott & Moon, architects, 8, Hanover Square, Lowgate, Hull.

HYTHE.—House, Stade Street, Scott Bros., builders, Hythe; house, Cannon Gate Avenue, for John Andrews; bank and residence, for the National and Provincial Bank, Ltd., A. Bromley, architect, Cheriton Place, Folkestone; F. Austin, builder; house, London Road, for F. Hoskins.

INVERURIE.—Alterations on house and steading, Mill of Easterstown, Fyvie. W. L. Duncan, architect, Turriff.

KEIGHLEY.—School at Steeton-with-Eastburn for the West Riding Education Committee. J. Hartley, architect, Swadford Chambers, Skipton.

KENDAL.—Extensive alterations to Mason's Arms Hotel. J. Hutton, architect, Kendal.

KILLARNEY (Co. KERRY).—Additions to the Post Office. H. Williams, Secretary, Office of Public Works, Dublin.

LANGLEY PARK (Co. DURHAM).—Houses for White & Lewes. Geo. T. Wilson, architect, 22, Durham Road, Blackhill (Co. Durham).

LAUNCESTON.—Dwelling house in Tavistock Road. E. Wise, architect, Launceston.

LEEDS.—Roman Catholic college (£22,000). Pair of semi-detached villas at Killingbeck; F. Mitchell, architect, 9, Upper Fountaine Street, Leeds. Alterations to Belgrave Congregational Church (£2,500); Rev. J. G. Sutherland, minister.

LEEDS (BRAMLEY).—New police station and residences for the Deputy Chief Constable and Chief Clerk (£9,489). Blacker Bros., builders, Bramley, Leeds.

(HEADINGLEY).—Baptist Chapel and schools (£8,500). P. Robinson, architect, Yorkshire Post Chambers, 53, Albion Street, Leeds.

LEIGH (SOUTH LANCS.).—New weaving mill at Butts' Bridge. J. W. Cowburn, contractor, Leigh.

LINCOLN.—Diphtheria Block at the Infectious Diseases Hospital (£1,850).

LITTLE HULTON (near BOLTON).—Block of houses in Manchester Road for W. Baxter, Manchester Road West, Little Hulton.

LIVERPOOL.—New Free Methodist Church at Garston.

LLANDWROG (near CARNARVON).—New Sunday Schools, chapel house, &c., for Bwlan Church. R. Lloyd Jones, architect, 14, Market Street, Carnarvon.

LLANELLY.—Welsh Calvinistic Methodist Chapel in Glenalla Road.

LLANELLY (PWLL.).—Two new pits for the Crown Colliery Co. Crown Colliery Co., Castle Buildings, Llanelly.

LLANISHEN.—Alterations and additions to "Hill Cot," for Capt. C. J. Wilkie. W. H. D. Caple, architect, 2, Church Street, Cardiff.

LONDON.—(MARYLEBONE, W.).—Alteration to electric lighting sub-station, Aybrook Street, Manchester Square. J. Wilson, town clerk, Town Hall, Marylebone Lane, Oxford Street, W.

(HARLESDEN, N.W.).—Alterations, &c., to Keble Memorial School, Crownhill Road. Kelly & Dickie, architects, 466, Oxford Street, W.

(WILLESDEN, N.W.).—Alterations, &c., to premises in Priory Park Road. Barnett & Brotchie, builders, Salusbury Road, N.W.

(CAMDEN TOWN, N.W.).—New sub-station (£4,950). Maurice Fitzmaurice, chief engineer, L.C.C., Spring Gardens, S.W.

(WILLESDEN, N.W.).—Shop and house, High Road; showroom, Craven Park Road. H. Shaw, architect, 60, Nicholl Road, Willesden.

(WILLESDEN GREEN, N.W.).—Three shops for Metropolitan Railway. J. Grover & Son, builders, 79, Shepperton Road, N.E.

(CRICKLEWOOD, N.W.).—Two houses, Shoot-up-Hill. H. B. Oldrey and Sons, builders, 7, West End Lane, N.W.

(WILLESDEN, N.W.).—Six houses in Chamber Lane. Callow and Wright, builders, Brondesbury Park, N.W.

(PLUMSTEAD, S.E.).—Post Office in High Street. H.M. Office of Works, Storey's Gate, S.W.

(NORTH WOOLWICH, S.E.).—Twelve houses in Fernhill Street. W. Harris, builder, North Woolwich.

(PLUMSTEAD, S.E.).—Eighteen houses. South Metropolitan Brick and Building Estates Co., King's Highway, Plumstead.

(TOTTENHAM COURT ROAD, W.).—Jewish home. Ernest Runtz, architect, 10, Walbrook, E.C.

(PLUMSTEAD, S.E.).—Workshops and store, Princes Road. H. H. Collier & Sons, cycle engineers, 18, Herbert Road, Plumstead.

(POPLAR, E.).—Manual training centre, Woolmore Street School. T. J. Bailey, education architect, L.C.C., Spring Gardens, S.W.

(STRATFORD, E.).—Enlargement of All Saints' Sunday School and new church institute (£2,500). Rev. E. Davies, vicar of All Saints' parish, Stratford, E.

(LEYTON, N.E.).—Additional school accommodation at Sybourn Street (£12,000), and at Canterbury Road (£7,000). Architect to Education Committee, Leyton Town Hall, E.

(PLUMSTEAD, S.E.).—Shop, Plumstead Common Road. A. H. Hutton, builder, 23, Chesnut Road, Plumstead.

(PLUMSTEAD, S.E.).—Additions to Christ Church. Kirk & Randall, builders, Woolwich.

(W.).—Residence in Upper Brook Street (£10,610). R. G. Hammond, architect, 16, Essex Street, Strand, W.C.

(BLOOMSBURY, W.C.).—Enlargement of Kingsley Hotel. Kingsley and Thackery Hotels, Ltd., Hart Street, W.C.

(LEYTON, N.E.).—Additional hospital accommodation (£650). W. Dawson, Council Surveyor, Leyton Town Hall, E.

(LEYTON, N.E.).—Alterations to factory in Grange Road. P. Cornish, architect, 641, High Road, Leytonstone.

(MARYLEBONE, W.).—Additions to 34, Queen's Road. G. T. Jell, architect, 70, Carlton House, Regent Street, W.

(SOUTHWARK BRIDGE ROAD, S.E.).—Reconstruction of engine house block at chief L.C.C. Fire Station (£8,650). H. L. Holloway, builder, Union Works, Church Street, Deptford.

(WIMBLEDON, S.W.).—Re-erection of premises, recently destroyed by fire, of G. Porter & Co., 12 and 12a, Merton Road, house furnishers.

(WIMBLEDON, S.W.).—House in Clifton Road. Thompson and Pomeroy, architects, Hill Road, Wimbledon.

(WIMBLEDON, S.W.).—Church in Herbert Road. W. T. Lowdell, architect, 25, John Street, Bedford Row, W.C.

(WIMBLEDON, S.W.).—Extension of offices. Hampton & Sons, agents, High Street, Wimbledon.

(WIMBLEDON, S.W.).—Two houses in Wilton Crescent. J. S. Brocklesby, architect, 116, Jermyn Street, S.W.

(HOLLOWAY, N.).—Extension of confectionery factory, George's Road (£1,000). George Carter, architect, 513, Holloway Road; Welbking & Co., builders, 60-62, Southgate Road, N.E.

(N.).—Extensions to Sanctuary, Chapel, &c., and alterations to Convent of the Blessed Eucharist (£1,500). G. Carter, architect, 513, Holloway Road, N.

(STOKE NEWINGTON, N.).—Disinfecting station in Milton Road. W. F. Loveday, Borough Surveyor.

(ST. PANCRAS, N.W.).—School extensions for the Governors of Frances Mary Buss Schools, Sandall Road, N.W.

(BLACKHEATH, S.E.).—Elementary School. Wills & Anderson, architects, 24, Bloomsbury Square, W.C.

(CANONBURY, N.).—Alterations, &c., Harecourt Congregational Church. G. Carter, 513, Holloway Road, N.; Campbell, Smith and Co., builders, 25, Newman Street, W.

(ROTHERHITHE, E.).—Superintendent's house, Rotherhithe Tunnel. W. E. Riley, Supt. Architect, L.C.C., Spring Gardens, S.W.

(HAMMERSMITH, W.).—Four shops and re-erection of public house (Queen Adelaide). C. G. Miller, architect, 65, Chancery Lane, W.C.

LONDON.—(GREENWICH, S.E.).—Addition to St. Ann's School. Bendon, Ltd., builders, 48, Chancellor Road, W.

(GREENWICH, S.E.).—Twenty-seven houses. A. Roberts, architect, 92, London Street, S.E.

(WHITECHAPEL, E.).—Additions to 11, Middlesex Street. Franks and Simons, builders, 354, Mile End Road, E.

(BERMONDSEY, S.E.).—Five shops and houses, Old Kent Road. F. W. Foster, architect, 41, Bedford Row, W.C.

(BERMONDSEY, S.E.).—Four houses, Oxley Street. Stock, Page and Stock, architects, 9, Denman Street, S.E.

(GREENWICH, S.E.).—Residence, Liskeard Gardens. Norman McDougall, "Clifton House," Greenwich Park.

(ST. GEORGE-IN-THE-EAST).—Building in Betts Street. S. D. Adshead, architect, 46, Great Russell Street, W.

(STEPNEY, E.).—Building, Ben Johnson Road. E. Jackson, builder, 10, Whitehorse Lane, E.

(HAMPSTEAD HEATH, N.W.).—Flats in East Heath Road. L. E. Hookway, builder, Beaufort Mansions, Chelsea.

(HAMPSTEAD ROAD, N.W.).—Shops, &c. Howell J. Williams, Ltd., builders, 11-17, Bermondsey Square, S.E.

(KING'S CROSS, N.W.).—Re-building Earges Hotel, 2-3-4, Liverpool Street. Higgs & Hill, builders, South Lambeth Road, S.E.

MALTBY COLLIERIES (LANCS.).—Sinking new shafts and other developments at Maltby Main Collieries.

MALVERN.—Proposed parish room, West Malvern; Rev. M. Macdonald, vicar. New Free Church Schools at the Wyche, for the Trustees; H. S. Scott, architect, Birmingham.

MANCHESTER.—Extension of Walton Lodging House (£4,000); Corporation. New Wesleyan Mission Hall, Peter Street; Morley & Son, architects, Bradford, Yorks.

(LITTLEBOROUGH).—School chapel at Featherstall (£1,000).

Suggested secondary school at Gorton; Education Committee. Extensions to St. Mark's Church, Gorton (£4,000); Rev. H. Smith, rector.

(MOSSLEY).—House and extensions to business premises at Roaches, for Mossley Co-operative Co. R. Worcester, architect, 1, Balloon Street, Manchester.

Alterations at Manchester Road Wesleyan Church, Droylsden.

MARGATE.—Five houses, Church Lane and St. Peter's Footpath, W. L. Bennett; five houses Victoria Avenue, F. W. Miles.

MARSDEN (YORKS.).—Houses, Manchester Road, for Whitehead & Hoyle.

MASHAM (YORKS).—Alterations and additions to the Elementary School. C. Clarke, Charlcot, Bedale.

MELTON.—Chapel at Melton Asylum. Brown & Burgess, architects, Arcade Street, Ipswich.

MERTHYR TYDFIL.—Rebuilding business premises at Pontlottyn, for Mrs. Phillips, 6, King Edward Villas, Merthyr; P. V. Jones, architect, Hengoed. Cottage Homes, Aberdare Valley (£1,150); Thos. Roderick, architect, Aberdare. Two pairs semi-detached villas; O. P. Bevan, architect, Express Chambers, Merthyr Tydfil.

(PENYDARREN).—Twenty-two houses for the Gellifaelog Building Club, Dowlais. Wm. Dowdeswell, architect, Treharris.

(PENYDARREN PARK).—Four pairs of semi-detached villas at the Walk, Penydarren Park, for the Grove Building Club. T. E. Rees, architect, Gernant, Merthyr Tydfil.

MIDDLESBROUGH.—Garden City on Ormesby Estate, near Middlesbrough, for Sir Christopher Furness, M.P. (£400,000).

MIRFIELD (YORKS).—New school premises and master's house, for Calder Farm Reformatory.

MONTON GREEN (near MANCHESTER).—New shop premises in Green Lane. J. F. Moore, builder, Chalwick Road, Eccles.

MORRISTON.—New Philadelphia Calvinistic Methodist Chapel.

MOTHERWELL (N.B.).—Halls in Airbles Street, for the Cairns U.F. Church Congregation (£3,000); dwelling houses in Dellburn Street, for J. Cummings, Leechlee Street, Hamilton; four houses in Kirkland Street, for Mrs. Donaldson, Kirkland Street; twelve houses in Airbles Street, for Mrs. W. Kidd.

NESTON (CHESHIRE).—Wesleyan Church (£1,750). A. E. Lambert, architect, 23, Park Row, Nottingham; D. Parks, builder, Grantham.

NEWCASTLE-ON-TYNE.—Alterations to Rutherford College Boys' and Girls' Schools. Secretary, Newcastle Education Committee, Education Offices, Northumberland Road, Newcastle-on-Tyne.

(WALKER).—Stables and other buildings in Lamb Street, for the Walker Co-operative Society, Ltd., Lamb Street, Walker.

NORTH WINGFIELD (NOTTS).—Enlargement of North Wingfield Rectory Schools.

NORTHALLERTON.—New Church at East Cowton (£1,500). Rev. R. G. Wood, vicar of East Cowton.

OAKHAM.—Wesleyan Methodist Manse in Cold Overton Road; Wesleyan Methodist Church at Knossington.

OSWALDTWISTLE AND CHURCH (LANCS.).—New Technical School. Secretary, Education Committee, Oswaldtwistle.

OULTON BROAD.—Church Institute in connection with St. Mark's Church. J. H. Allen, churchwarden, St. Mark's.

PONTARDAWE (SWANSEA VALLEY).—Additional Tinplate Mills, for Gilbertson and Co. (£30,000).

PONTYPRIDD (CILFYNYDD).—Alterations, renovations and additions at the Primitive Methodist Chapel. P. J. Jones, architect, Brynawell, Cilfynydd, Pontypridd.

Conversion of premises into Bank for the Metropolitan Banking Co Ltd. Gibson, Parry Williams & Co., architects, Pontypridd.

PORTDINORWIC.—Villa for Capt. B. Willams. E. P. White, architect, Carnarvon.

POOL (near LEEDS).—Wesleyan Chapel and Sunday School (£1,450).

PORT TALBOT.—Co-operative Shop and Stores at Glyncorrwg. Evans and Jones, architects, 5, Station Road, Port Talbot.

PORTH.—Two semi-detached houses at Cymmer for Miss A. Jones. J. T. Jenkins, architect, Porth.

PRESTON.—New school for the T.C. in the Deepdale District (£12,500).

READING.—Warehouse and stabling. G. W. Webb, architect, Market Place Chambers, Reading.

REDRUTH.—Rebuilding business premises in Fore Street. L. Winn, architect, 27, Roscawen Street, Truro.

ROCHDALE.—New police station in Mellor Street (£1,400).

ROCHFORD (ESSEX).—New schools at Rayleigh (£2,705). F. & A. Willmott, builders, Ilford.

ROTHERHAM.—Houses, Pitt Street, for Wm. Charles; Fitzwilliam Road, for Thos. Bartholomew, 162, Nottingham Street; Henley Grove Road, for executors of W. Tummon; alterations and additions to the Grammar School for the Governors.

ROWLEY.—Public Library. Wills & Anderson, 24, Bloomsbury Square, London, W.C.

ROYTON (LANCS.).—Eleven houses and a shop in Shaw Road, for Bell Spinning Co.

RUGBY.—Works, Lower Hill Morton Road, for J. Findlay. J. G. Satchell, architect.

ST. HELENS.—New mission hall. J. Ellison, builder, 108, Boundary Road, St. Helens.

ST. MARGARET'S (Kent).—Houses, for Mr. Gwyther, Mr. Roffey, builder, St. Margarets; Kingsdown Road, for C. E. Beaufoy.

SALTNEY (near Chester).—New school for Chester and Flintshire Education Committees. S. Evans, architect, Mold.

SANDYFORD (Co. Dublin).—New R.C. Church (St. Patrick's) at Glencullen.

SHEFFIELD.—Extension of Dronfield Woodhouse Wesleyan Methodist Church (£543).

SHILDON (Co. Durham).—Extension of the machine shop at Shildon Wagon Works, for the North-Eastern Railway. W. Bell, architect to the N.E. Railway Co., York.

SKEGNESS.—New St. Paul's Baptist Church.

SLEAFORD.—Wesleyan School Chapel in Grantham Road. A. E. Lambert, architect, 22, Park Row, Nottingham.

STAMFORD.—House, Princes Road, for J. M. Rouse; rebuilding of the Crown Hotel.

SLOUGH.—New St. Ethelbert's Roman Catholic Church (£7,000). Benedict Williamson, architect, Godson & Sons, contractors.

SMETHWICK.—Renovation of the Town Hall and Public Library, High Street. C. J. Fox Allin, borough surveyor, Council House, Smethwick.

SOUTHAMPTON.—Proposed E.L. installation at Bassett for Lord Swaythling; New Sailors' Home in Canute Road.

SOUTHPORT.—Proposed band and concert hall for the T.C. (£8,500).

STANLEY (Co. Durham).—Alterations and additions to St. Joseph's Catholic Schools. Brodrick, Lowther & Walker, architects, 77, Lowgate, Hull.

STOKE-ON-TRENT.—Alterations and additions to Smallthorne Council School (£495). T. Godwin, builder, Hanley.

SUTTON (Surrey).—Additions to Banstead Asylum. W. E. Riley, superintendent architect, L.C.C., Spring Gardens, S.W.

SWANSEA.—Additions to parochial schools (£1,100); G. Davies, builder, Swansea. Proposed rebuilding of the Arsenal and erection of drill hall, lecture hall, offices, &c., for the Volunteers.

TODMORDEN.—Houses in Castle Street. J. A. Ingram, builder, Halifax Road, Todmorden.

TONBRIDGE.—Villas, Douglas Road, for Mrs. J. F. Monckford; Douglas Road, for H. Meades; proposed new premises for the Y.M.C.A.

TUTBURY (Staffs.).—New Council school (£3,498). Geo. Hodges, builder, Burton-on-Trent.

UXBRIDGE (Middlesex).—Alterations to laundry at Hillingdon Heath, Mr. Lee; alterations to the Breakspears Arms, Harefield, T. Strutt.

WALTON-LE-DALE.—New water works for the Urban District Council.

WEDNESBURY.—Primitive Methodist chapel, King's Hill. C. W. D. Joynson, architect; Hammond Bros., builders, Darlaston.

WHITEHAVEN.—Alterations and additions to Whitehaven Theatre.

WINDSOR.—Houses, Clewer, for Mr. Foreman; Lower Village Road, Sunninghill, for C. Hunt; pavilion, St. Mark's School, for Rev. C. N. Nagel.

WISBECH (Sutton Bridge).—House for J. Scarborough. G. Thorpe, architect, Post Office Lane, Wisbech.

WOLVERHAMPTON.—New schools for Bingley Street and Brick-kiln Street districts under consideration, Wolverhampton Education Committee.

YORK.—Houses, Heslington Lane, Fulford, for J. W. Chapman; Boroughbridge Road, for H. Atkin; Hill Row Street, Bishopsthorpe Road, for G. Moss, builder; shops and houses, Poppleton Road, for the York Equitable Industrial Society; music rooms, Dalton Terrace, for the Friends' School Trustees; alterations and additions to Albany Hall, Goodramgate, for H. B. Cooper.

NOTES.

Water-power in Germany.—It is announced that, in addition to the schemes under the consideration of the Bavarian Government for the utilisation of water-power in connection with the projected conversion of the steam railways to electric traction, the Prussian Ministry of Public Works has similar plans on hand in respect of the use of water-power. The electrical energy is to be used for the working of State railways, and the supply of power for the operation of the electric towing system on the Teltow Canal is also taken into consideration. The Government department is to undertake preliminary inquiries as to the water-powers available and as to which of them are serviceable for private interests.

Municipal Employés.—We have received from the Industrial Freedom League, 124, Palace Chambers, Westminster, an informing circular containing a number of important opinions concerning the growth of municipal employment and its effect on elections. Those who are interested in municipal trading matters and want a few facts on the above subject would do well to write for a copy of this publication.

Smoke Abatement.—There was some plain speaking about the emission of smoke from electricity generating stations at the ninth annual meeting of the Coal Smoke Abatement Society, at the Royal United Service Institute on Friday last. Sir Wm. B. Richmond, K.C.B., R.A., presided. It was stated in the course of the annual report that a number of Bills recently introduced into Parliament, and in some cases successfully carried through, contained clauses which, in the opinion of the Society, were inimical to the interests of the public. The promoters of these Bills aimed at obtaining exemption from liability in respect of nuisances, including smoke nuisances. Special attention was directed to the "serious fact that much of the smoke nuisance from which the metropolis suffers now emanates from electric generating stations." Complaints were made during the past year to and by the Society in regard to 35 works, and of these 20 were generating stations erected, maintained and worked by the very local authorities whose duty it was to suppress pollution of the air by smoke. The difficulty of dealing with nuisances emanating from electric generating stations had been greatly enhanced "by the lamentable decision of Mr. Curtis Bennett in the case of the Chelsea Borough Council, who had issued summonses against the Underground Electric Railways, Ltd., in respect of smoke nuisances observed in connection with the large generating station at Lot's Road, Chelsea." The Magistrate came to the conclusion that the smoke emitted from the four shafts was not black, and unfortunately no generally accepted chart or simple instrument by which the colour of smoke might be readily and satisfactorily identified had yet been devised. If Mr. Curtis Bennett's decision that the blackness of the smoke must be scientifically established was generally acted upon, there could be no doubt that the movement for smoke abatement would receive a great check. The Committee was making an effort to induce the Electric Power, Gas, and Smokeless Fuel Companies to combine in establishing a permanent exhibition of apparatus, methods, and fuel for the abatement of smoke from dwelling-houses as distinguished from industrial premises.

In moving the adoption of the report, the chairman said he thought the Society could not do better than go on with the "dogs" at the various local authorities. Under its auspices a series of lectures for the education of stokers had been instituted. So much depended upon satisfactory stoking, that it was an acknowledged fact that it would be well if this country followed the example of Germany by subsidising classes for that purpose.

Dr. H. A. Des-Vœux, in seconding the motion, referred to the electricity generating works in respect of which smoke nuisances were reported by the Society in 1907. As a matter of fact, he said, there were more electricity generating works in the metropolis controlled by private companies than by municipal authorities. The position regarding the latter was that the authority which owned them was also the prosecuting authority. In short, one committee of a local authority had to prosecute another committee of the same corporation. This he regarded as an impossible position, because the Corporation works went on emitting smoke which caused a nuisance without any steps being taken to put it down. His contention was that in all Bills authorising local authorities or private companies to make electricity, there should be a clause inserted explicitly prohibiting the emission of smoke from their respective works. The annual report was unanimously adopted.

Mr. Joseph Hurst remarked that the provisions of Sec. 81 of the Schedule of the Electric Lighting Clauses Act of 1899, which freed the owners of generating stations and works from prosecution for the emission of smoke, had been very successfully submitted as a defence. In this connection he mentioned that in the Committee stages of the London and District Electricity Supply Bill efforts had been made to make the company responsible for that measure free from prosecution for smoke emission. The secretary of that Society had written to the Joint Committee pointing out the objectionable feature of the clause which would exempt the promoters of the Bill from prosecution for smoke emission. It was, therefore, proposed by the Society, that the following proviso to Clause 3 of the Bill should be inserted:—

"Provided nevertheless that nothing in this Act shall exonerate the company from any indictment, action, or other proceeding for nuisance caused or permitted by the company on any lands used by them for generating electrical energy where such nuisance is caused:—

"(*a*) By non-consumption of smoke.

"(*b*) By the reasonably preventible evolution of oxides of sulphur.

"(*c*) By the use of any refuse destructor.

"(*d*) By the emission of oil or other matter in conjunction with steam."

The insertion of such a proviso by the Joint Committee of both Houses of Parliament would, he contended, protect the public against the nuisance of which the Society complained.

The chairman, responding to a vote of thanks, took occasion to refer to the black smoke which he alleged was emitted from the shaft of the generating station at the Franco-British Exhibition. This, he contended, was rapidly converting the White City into a black one, while at the same time it was causing considerable injury to the works of art which had been loaned by the French Government. Care, he thought, ought to be taken not to send their works of art back dirtier than they were when received. The Society might very well forward a communication to the Council of the Franco-British Exhibition suggesting that they do all in their power to mitigate the evil. In any case, it would be to the Society's advantage if the Council of the Exhibition were made aware of the nuisance. The shaft he described as being as black as any they had in London.

International Exhibitions.—It is gratifying to learn that the Board of Trade has decided to form a new branch of its commercial department, to deal with matters relating to the participation of this country in future international exhibitions, and to superintend the organisation of British exhibits in connection therewith. Mr. U. F. Wintour, at present secretary of the Advisory Committee on Commercial Intelligence, is to be the officer in charge of the exhibitions branch. It will be remembered that the importance of organised effort in connection with international exhibitions formed the subject of several articles in the Electrical Review (December and January last) shortly after the issue of the report of the Departmental Committee.

Canadian Trade.—The Board of Trade has appointed Mr. R. Grigg, who recently completed a commercial mission in Canada and Newfoundland for the Advisory Committee to the Board of Trade on Commercial Intelligence, as His Majesty's Trade Commissioner in Canada. A number of gentlemen have been appointed as local trade correspondents in Canada. Mr. Grigg's report was considered in our issue of March 13th last.

(*Continued on page* 64.)

THE ELECTRICAL EQUIPMENT OF THE ROYAL MINT, LONDON.

There are, perhaps, few places which have more hold on the public imagination than the Royal Mint on Tower Hill, and, therefore, a description of its electrical equipment will be of interest; it will be at the same time particularly opportune, as within the past twelve months the last sections of direct steam-driven plant have been provided with motor drives, and at the present moment practically all of the machinery is electrically driven, and electric light exclusively is employed throughout the buildings.

Until 1905 the major part of the machinery was driven by three large engines of the marine type, by means of a system of underground shafting connected by gearing.

These engines occupied the whole of the present main engine room, and had been in use since 1882. It was seen, however, when extensions became necessary, that to increase the heavy frictional losses, by additional shafting and gearing, would be unwise, and it was, therefore, decided to gradually substitute electrical drives throughout. It should be mentioned also that for many years prior to 1905 electricity had been generated in the Mint for supplying energy for lighting purposes and for a number of scattered motors.

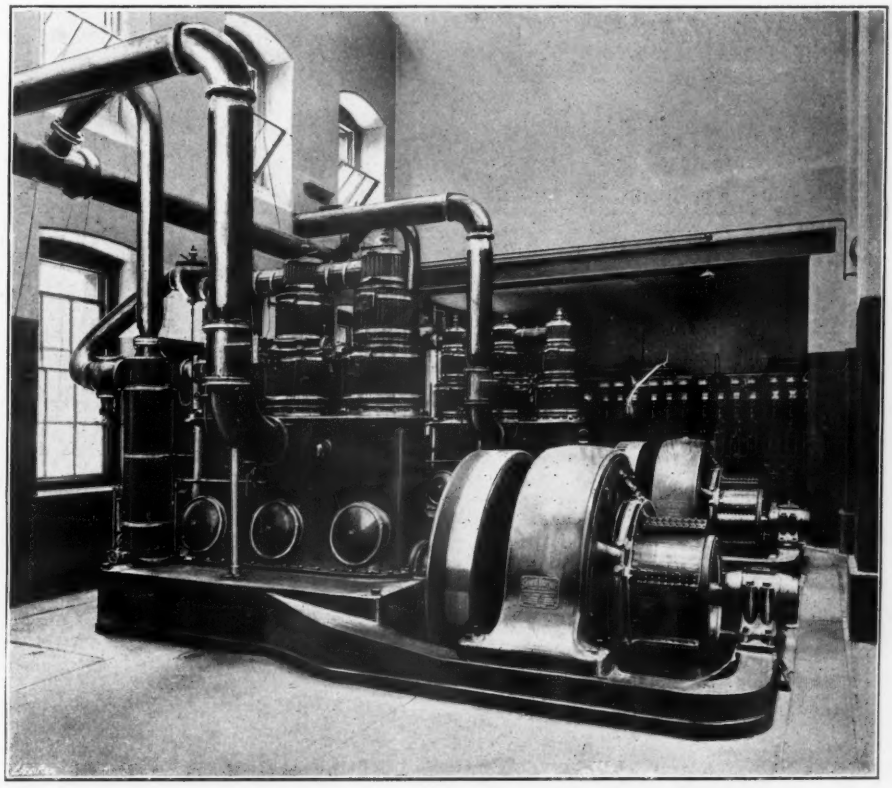


Fig. 1.—Main Engines and Generators.

The generating plant, as it now stands, comprises two Willans high-speed engines coupled direct to two Siemens d.c. generators of 200 kw. capacity each. Steam is supplied from six Lancashire boilers fitted with mechanical stokers of the Vicars type.

These boilers also supply steam for three smaller Siemens-Willans sets which are used for battery charging purposes, and for supplying energy to the main plant when the larger sets are not running.

To obviate the necessity of steaming the boilers during occasional periods when the operative department is closed, and when energy is required mainly for lighting the residences, a Crossley gas engine has been installed, and is used in conjunction with a 50-kw. Siemens generator for charging the batteries, or for giving a direct supply.

In the boiler house the boilers are arranged on either side of a central thoroughfare, above which a coal-conveying system is fixed with shoots down to the coal hoppers on each side. The coal is brought from a store-house capable of holding about 50 tons of small coal. It is first raised by means of bucket elevators and then carried along to the shoots by means of a drag plate conveyor.

The boilers are 22 ft. 6 in. long and 7 ft. in diameter. Each is fitted with a dead-weight and a spring safety valve and a low-water whistle. Feed water is supplied by Worthington pumps, and the working pressure is 120 lb. per sq. in.

A Wollaston water-softening plant is in use, and is combined with a feed-water heating system. A rise in temperature of 100° F. is produced, part of the exhaust steam being used for this purpose.

The accompanying view (fig. 2) shows the central thoroughfare between the boilers and the pump house at the further end.

The main steam pipes are of steel, and were supplied by Messrs. J. Foster, of Preston; provision has been made in the engine room for connecting up a third engine and generator should that become necessary in course of time.

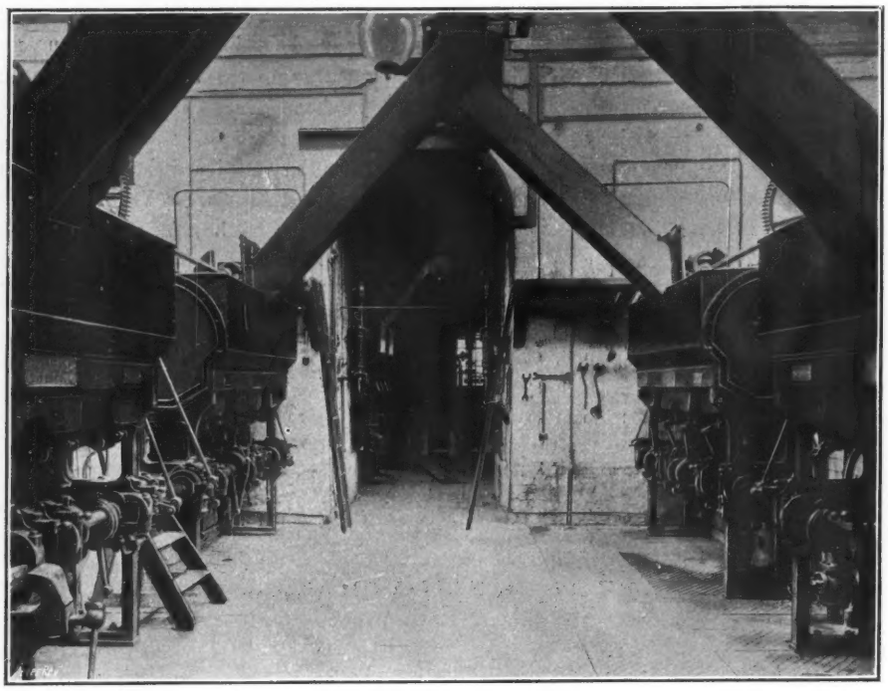


Fig. 2.—Boiler House.

The main Willans engines are of the three-crank compound type, and have a steam consumption of 22·9 lb. of steam per I.H.P. per hour on full load. The speed is 350 R.P.M. Exhaust takes place partly into the atmosphere through exhaust heads, and partly into the heating tank of the above-mentioned water-softening plant.

The D.C. generators which are coupled direct to these sets are six-pole compound-wound machines operating at 110 volts. They supply energy for power and lighting. On full load the combined sets have an overall efficiency of 78 per cent.

The view of the engine room given in fig. 1 shows the two main generating sets and part of the switchboard. A full view of the latter is given in fig. 5.

The switchboard is of black enamelled slate 1¼ in. thick, and was made by Messrs. E. & F. Moy, Ltd.

Each generator panel is provided with 2 S.P. 2,000-ampere "Acme" patent switches, reverse-current circuit-breaker, field switch and regulating resistance handle, voltmeter and ammeter, and B.T.-H. switchboard type recording watt-hour-meter.

Two sets of bus-bars are carried at the back of the board, one set being used for the main generators and the other set being connected to the bus-bars in the auxiliary engine-room.

The positive bus-bar for the main generators is in duplicate, and either generator, if necessary, may be made to supply any particular set of feeders independently of the other, each distributing panel being provided with a special plug-block, from which connection may be made to either of the two positive bars. The negative bar is common to both generators, and for parallel working, of course, the two positive bars are coupled together. The distributing switches are of the tandem D.P. quick-break knife type, and have a two-way action.

The upper contacts throw the load on the main generators, whilst the lower contacts make circuit with the system in the auxiliary engine room. In this way, as already mentioned, either the batteries or the small sets may be made to feed the main power circuits when required. The feeders are protected by shunted strip fuses on each pole. An insulation testing set has been fixed at one end of the board, and readings are taken each day. Any leakage occurring cannot, therefore, remain long unnoticed, and is readily located.

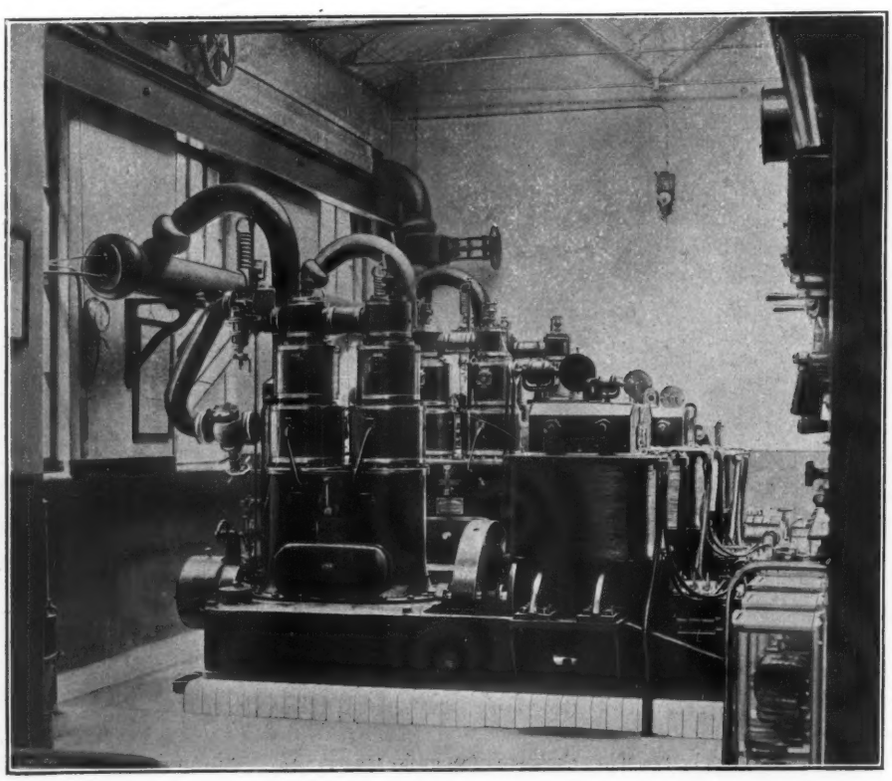


Fig. 3.—Auxiliary Engine Room.

A D.P. change-over switch has also been provided for the purpose of coupling the lighting load direct to the main generators during running hours.

The auxiliary engine room is shown in fig. 3. The three Siemens-Willans sets in use here formed part of a plant erected in 1899, but they are now used mainly for battery-charging purposes. The engines were formerly worked on one expansion of steam only, but have recently been compounded.

Two of the generators are of 50 KW. capacity each, and operate at 100-140 volts, whilst the third is wound for 140-160 volts, and is used for "boiling up" the cells at regular intervals. They are all Siemens two-pole machines of the Edison-Hopkinson type, and run at 450 R.P.M.

The switchboard seen in the view of this room controls the lighting circuits, and can be fed from either the batteries or the last-mentioned generators, or from the main generators.

A battery-charging board is also installed at the extreme end of the room, and in close proximity is the operating handle for the battery regulator.

A view of the batteries is given in fig. 4. They consist of two sets, of 58 cells each, of E.P.S. OK lead alloy crate cells, and have a total capacity of 5,000 ampere-hours. A special feature of the battery room is the efficient ventilation provided by a series of grated openings in the walls, in place of windows.

The batteries supply the lighting load when the steam plant is not running, and are capable, in addition, of taking a considerable motor load, when that is necessary.

FIG. 4.—BATTERY ROOM.

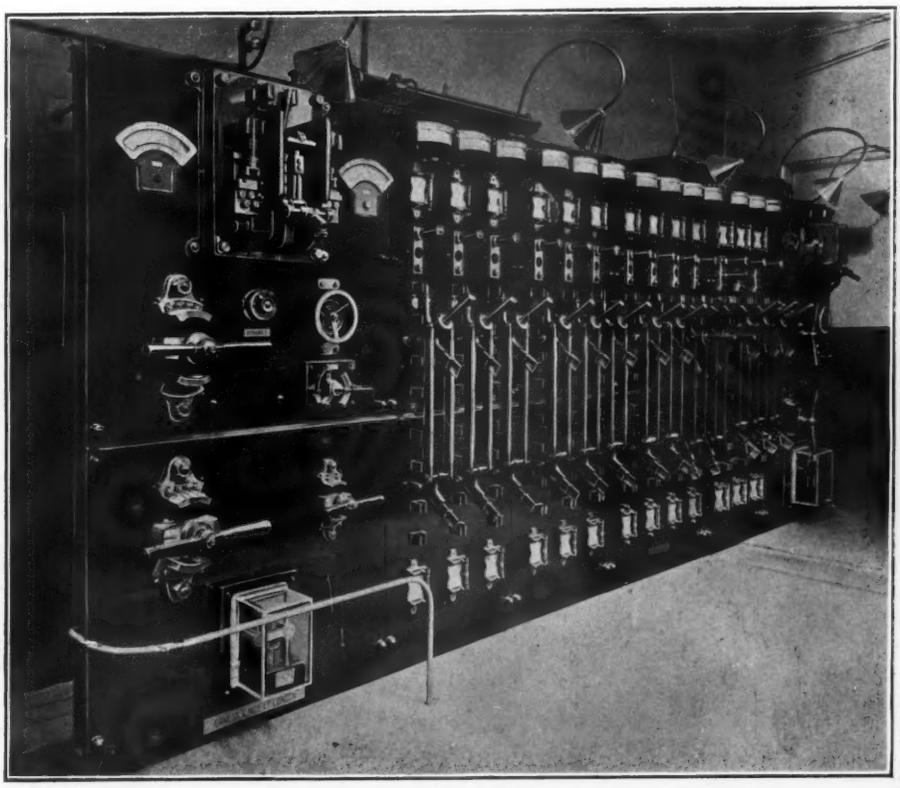


FIG 5.—MAIN SWITCHBOARD.

The lighting and power mains are kept as far as possible distinct, and are carried through the buildings, for the most part, in insulated conduit.

The various departments are lighted by means of arc and incandescent lamps. Of the former there are 66 of the Jandus enclosed type in use, and of the latter an aggregate of 2,085 in equivalent 8 C.P.

During 1907 the average total monthly output of the generators was 19,616 units, as against 15,566 in the previous year.

The number of motors in use in the Mint is 64, and their combined H.P. is 600. With one or two exceptions they are of Messrs. Siemens Bros.' make, and are provided with the usual starting switch with overload cut-out and no-volt release. In the case of several of the larger motors, however, the starting switches are of the pedestal type, and have been supplied by Messrs. E. & F. Moy.

A brief description of the process of coining may be of interest, and, at the same time, will afford an opportunity of indicating how the use of electricity has been adopted in nearly all departments. Gold and silver bullion on being received into the Mint passes through the following operations:—

1. *Assaying.*—To ascertain the exact degree of fineness so that the correct quantity of alloy may be added.

2. *Melting.*—This is carried out in specially constructed furnaces, using coke as fuel. Graphite crucibles are employed, and at each charge the necessary amount of copper alloy is added to bring the contents to the legal composition. In the silver-melting house, the crucibles, being of a larger size than those used for gold and carrying a much heavier charge, are handled by means of an overhead travelling crane electrically driven, and operated from a switch table on the ground level.

After being poured into moulds of the required size, the

rough bars thus formed are trimmed at the edges at a circular file. A second assay is then made to ensure that the correct composition has been attained.

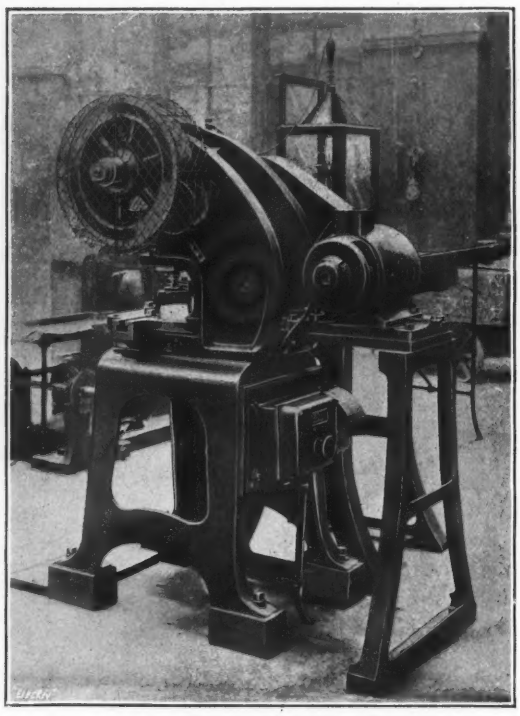


Fig. 6.—Small Motor Drive for Trying Cutter.

3. *Rolling.*—The mills in use carry rolls varying in diameter from 15 in. to 8 in. and are all electrically driven. In order to economise floor space, it was necessary to arrange for the driving gear to be as much as possible underground, and, with two exceptions, this has been done entirely.

The larger "breaking-down" mills are driven in some cases by means of a Renold chain, and in others direct gearing by means of spur wheels and pinions is adopted.

Fig. 7 shows a recently added 15-in. mill having a 70-H.P. motor driving direct on to a heavily fly-wheeled countershaft through a spur-wheel and pinion. This is in turn coupled to the bottom roll shaft by similar means. A pair of coupling pinions connect the two roll shafts at a point close to the large spur-wheel, and a form of flexible coupling is provided between the pinion housings and the rolls themselves. Provision is thus made for the roll centres to be altered to suit bars of various sizes.

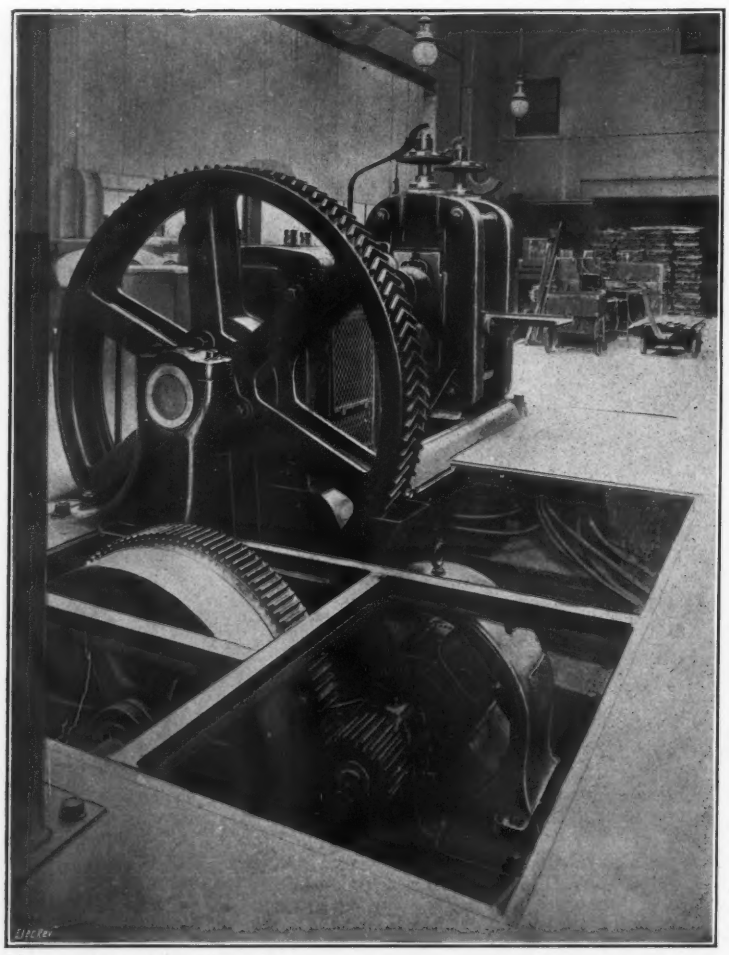


Fig. 7.—15-inch Rolling Mill, showing the Motor Drive.

The other type of driving is on similar lines, except that the motor is coupled to the countershaft by means of a chain, the chain wheel on the latter being fitted with a "spring" boss to minimise any jerking action that may occur.

In the case of the intermediate and small size mills, the driving is by means of a Renold chain direct on to the extended roll end, from a geared countershaft in the frame of the motor.

The motor pits are covered over with chequer plates, which can be readily removed when the motor or any part of the gearing requires to be lifted out. This is seldom necessary, however, as sufficient space has been left in the pits to permit of minor repairs, &c., being carried out on the spot.

During the process of rolling, annealing becomes necessary in some cases, and is effected in gas-heated muffle furnaces.

Before being sent to the cutting room the "fillets" are carefully tested, and specimen blanks are cut by means of a trying cutter.

These are weighed against a standard weight, and if the variation does not exceed certain limits, the fillet from which they were cut is sent forward. Fig. 6 shows the use of a $1\frac{1}{8}$ H.P. motor for operating a trying cutter.

4. *Cutting and Marking.*—The cutting-machines in use are arranged along each side of the cutting room, and are belt driven from two countershafts, which in turn are each driven by a 10-H.P. motor.

After being cut the blanks are edge-rolled or "marked" for the purpose of bringing them to a uniform diameter. The thickened edge, also, which is thus produced, serves as a protection for the design on the finished coin.

The skeleton fillets, known as "scissel," which remain, are bound up in bundles and returned to the melting house.

5. *Annealing.*—The annealing of the blanks is carried out partly in gas-heated muffle furnaces, and partly in gas-heated rotary furnaces.

After being thus softened it is necessary in the case of silver to pass the blanks through the "pickling" or "blanching" tanks (which contain dilute sulphuric acid) before washing them in pure water and drying them in rotating drums charged with beechwood sawdust.

All silver coins are annealed in the rotary furnaces, as these, being in free communication with the atmosphere, permit of the formation of a thin coating of copper oxide during the process. The object of "pickling" or "blanch-

ing" is the removal of this coating of oxide. By thus removing all traces of the alloy from the surface, the appearance of the finished piece is improved.

The power necessary for the several drives in this department is supplied by four motors of ¾, 4, 6 and 10 H.P. respectively.

6. *Coining.*—The coining press room contains 19 presses, which are all driven by belting from a common shaft. This shaft extends along the centre of the room below the floor level, and is in turn belt-driven from a 40-H.P. geared motor placed in a pit excavated for that purpose.

The presses are each capable of striking about 40,000 pieces per day, and are adapted by means of suitable coining collars for forming the milled edges on certain denominations, simultaneously with the operation of stamping the impression.

7. *Weighing.*—The gold and silver coins are separately weighed in delicately-adjusted automatic weighing machines.

The machines distinguish between "light," "heavy," and "standard" pieces, and are capable of weighing about 22 coins each per minute. It will at once be seen how beautiful is the construction of these balances, when it is stated that in the case of half-sovereigns, all pieces which vary more than 0·15 grain in weight from the legal standard are deposited in either the "light" or the "heavy" receptacle as the case may be.

The driving of these balances, of which there are 49, is effected by means of a small atmospheric engine through a line of light overhead shafting and gut lines. The variation in speed which occurred with the old steam plant was too great to permit of a satisfactory drive being obtained from that source, and although an electric drive would be no doubt much steadier, it would not equal the present method.

In the weighing room also the coins are overlooked, and, in the case of gold and certain denominations of silver, separately rung on an iron block to ensure that no "dumb" pieces are issued to the public.

8. *Telling or Counting.*—All silver and bronze coins are counted in specially constructed "telling" machines. In the case of gold the "telling" is performed in a different manner, and at an earlier stage. At the present time two machines are in use, whilst a third is in course of construction.

The coins are charged in from an elevated platform, each bag being emptied on to an open table, which is sloped off at one end to allow the pieces to slide by gravity into a slot in which they are carried against the edge of a jockey wheel of irregular circumference. The uneven motion of this wheel causes the pieces to pass in single file into a final straight section of the guiding slot. In the middle of this section the coins are lightly gripped between the rims of two small rubber-tired flat pulleys, suitably driven by gut lines. In this way a regular succession of pieces is thrust forward to a steel disk, the edge of which is cut into semi-circular notches into which the coins fit. This disk is connected to mechanism, which automatically stops delivery after it has made a certain number of revolutions.

In the case of half-crowns, which are made up into bags containing 800 pieces, the disk used would contain 16 notches, and would be set to rotate 50 times in order to fill one bag.

The larger machine will count three-quarters of a million pieces a day in certain denominations, whilst the smaller one will count half a million.

They are both electrically driven, by motors of 3 H.P. and 2 H.P. respectively.

The Mint possesses, in addition to the departments already described, a die and medal department, a smiths' shop, and a well-equipped machine shop, and in these all driving is done electrically.

A complete system of electric clocks has been installed by the Magneta Co., and the various offices are in telephonic communication with one another, and with the National Telephone and G.P.O. systems.

In conclusion, we desire to express our indebtedness to the Deputy Master of the Mint for permission to describe the installation, and to Mr. J. T. Becklake, of the Operative Department, for assistance given in connection with the preparation of this article.

REVIEWS.

Technical Thermodynamics. Vol. I. By Dr. Gustav Zeuner. Two Vols. London: Archibald Constable and Co. 1907. Price 36s.

This, the first English edition from the fifth revised edition of the author's work, "Grundzüge der Mechanischen Wärme Theorie," has been translated admirably by Dr. Klein, of the Lehigh University. Dr. Zeuner's work has been the standard authority on the subject for forty years in Germany, and has been amended, extended, revised, and widened in its scope as from time to time has been found necessary and desirable. Zeuner has never been distinguished as a mere theorist, but has always, as his translator remarks, possessed the engineer's instinct for checking things by experiment, and for properly appreciating the limits imposed by practical conditions. Of course, it is the practical—the material—environment of the working fluid in every heat engine, which renders it futile to apply to the heat engine rules derived from the fundamental principles which govern the ideal heat engine. Still, with all the limitations of practice, the engineer who has mathematics sufficient to read Zeuner, and practical knowledge sufficient to appreciate just how far to carry pure theory into practical cases, will not be badly armed for the study of the heat engine, and generally, and perhaps more particularly of the physics, of gas engineering, which every day play a more important part in the science of motive power engineering.

In the first volume the fundamental laws of thermodynamics and the theory of gases are chiefly dealt with. The introduction is a general *résumé* of the atomic theory, the theory of etheric vibration and the unity or co-relation of the physical manifestations, light and heat, followed by an historical account of the theoretical reasoning of Mayer and the experiments of Joule in ascertaining the mechanical equivalent of heat. It seems strange to-day that though it was known that heat was generated by work, the truth was probably obscured by the fact that the effects observed were obtained by frictional means, *i.e.*, by direct rubbing of solids. To Joule is due the knowledge that a given amount of work always represents a definite quantity of heat. Hirn again measured the total heat in the steam entering an engine, and the amount of heat which entered the condenser, and he found that the latter was the less of the two; from this comparatively crude method he found $J = 752{\cdot}76$, which did not very materially differ from the value as determined by Joule. Hirn also found by means of a falling weight, and the compression of lead, that $J = 774{\cdot}68$, a very near approach to Joule's own value.

The author of this book adheres to the mean value given by Joule, viz., 772·83 ft. lb., or 424 m. kg.

This was the figure adopted by Clausius, so that there is much to be said for it, though it is now generally admitted to be a trifle small, Rowland's value of 778 being much used to-day.

In the first section following the introduction, the fundamental equations of thermodynamics are dealt with under the headings of the inner work of a body, the external work, reversible cycles, Carnot's cycle and so on.

In the second section, on gases, the author refers to the fact that the so-called permanent gases have been liquefied, and, therefore, it now seems to be time to treat all gases as "vapours," and to acknowledge no longer the term permanent as applied to any gas whatever. The conclusion, he says, reasoning from the life history of superheated steam in its ascent from ice into a condition in which it behaves like a permanent gas, is that gases are nothing but vapours which are highly superheated, for to the physicist there is no limitation of the meaning of heat short of its absolute disappearance at or near $-274°$ C. Practically we may conceive conditions in which complete agreement with Boyle's law is obtained, and a gas is ideally perfect, as distinguished from a vapour still in the presence of its liquid of origin even at the same temperature.

On the question of dissociation the author regrets the lack of experimental data, but throws out the suggestion that dissociation is partial and progressive with temperature

just as a vapour may exist in the presence of its originating liquid, and as the amount of vapour increases with additional heat and the liquid diminishes, so with additional heat will the ratio of dissociated gas in a mass of highly heated gas increase as the temperature rises. This dissociation may, perhaps, be said to resemble a further and higher condition of evaporation, the process of dissociation rendering latent a further amount of heat. That dissociation does occur at high temperatures is certain, but practically nothing is known as to the time it commences, the rate at which it proceeds as temperature rises, or the bearing which it has upon the so-called variability of specific heat.

Indeed, specific heat variation has been denied, but the denial can hardly be considered tenable. True, water-gas may split up and show no visible difference, but carbon dioxide, which has been shown to have a variable specific heat, would surely manifest plainly any dissociation into O and C, for the carbon would be obvious. The author, taking all things into purview, does, however, consider it justifiable in thermodynamics to distinguish between gases and vapours, especially as the equations of the mechanical theory of heat are simpler for gases than for vapours, which saying rather savours of an excuse that has already been declared unnecessary.

Most bodies resemble water in that they pass successively through the conditions of solid, liquid, vapour, gas; but there are bodies which omit a stage, passing from solid to vapour without liquefaction or fusion, and others again experience immediate dissociation without passing through a preliminary evaporation.

Again, there are vapours that can never be considered to be true gases until they have dissociated, when, of course, the substance before us is not the original substance at all.

The true gas has the equation of condition denoted by $p\,v =$ constant at constant temperature. This is the law of Boyle or Mariotte, while Guy-Lussac's law states that the increment of volume of a gas is proportional to the increment of temperature when expansion is at constant pressure.

For certain gases Regnault proved by experiment that certain constants A_v and A_p are almost identical. In an absolutely perfect gas, these two constants for computations at constant volume and at constant pressure would be equal. All gases except hydrogen have A_p less than A_v. Hydrogen, curiously, has the reverse, and this would almost seem to indicate that hydrogen was more than perfect as a gas, but we know this cannot be true, or else hydrogen would not liquefy under any conditions.

Though there are doubts expressed as to the absolute zero being — 273° C. or — 274°, the author adheres to Regnault's figure, which was the former, or — 459·4 in Fahrenheit degrees, as was done by Clausius.

The author next proceeds to discuss the laws of gas mixtures, of specific heat, of entropy, and of the isothermal and isodynamic curves for gases, the latter being the curve representing the change of the pressure p with the volume v, when the inner work U is kept constant during change of state, the heat added or withdrawn being transformed into or generated by such work respectively. For gases the two curves are identical, but they differ with vapours.

The adiabatic curve and the variability of specific heat of gas are next considered. This is a particularly important section, for until more is known of this question the investigation of gas-engine problems must always remain unsatisfactory.

For water vapour the formula given for specific heat is $c_p = 0{\cdot}4318 + 0{\cdot}000318\,t$ and $c_v = 0{\cdot}3211 + 0{\cdot}000318\,t$. It is satisfactory that the author considers that when one is investigating internal combustion engines the idea of constancy of specific heat must now be definitely abandoned, especially since water gas and CO_2 are such wide variants from the formerly accepted constancy. For all practical air engines, however, a constant value of 0·237 may be adhered to.

In the applications of the theory, reversible changes of state are considered; next, non-reversible changes, flow and efflux of gases, theory of air engines, followed by a section on closed hot-air engines, regenerators, &c., open hot-air engines, cold-air engines, closed and open; internal combustion engines, and finally the Otto engine and the Diesel engine.

The first volume closes with general conclusions on the working value of fuels, external combustion engines and internal combustion engines.

NOTES.

(*Concluded from page* 58.)

Swiss Federal Fuel-Testing Laboratory at Zurich.—The *Engineer* describes a fuel-testing laboratory at Zurich which has been inaugurated as a direct result of the acquisition of the main lines of railway by the State. The executive deemed it necessary to institute a system of fuel testing, and this is the more important because there is no coal mined in Switzerland, and the whole of the fuel must be imported. The decision was arrived at that all fuel must be purchased on the basis of its calorific capacity, other properties being also suitable. The Federal Government furnished the laboratory, and working costs were intended to be covered as far as possible by fees. At the same time, tests were to be carried out somewhat below actual cost so as to induce the public to send in samples—an excellent parallel for the old woman and the eggs. About £1,100 were spent in altering an existing building to suit the purpose of the laboratory, and about £900 were expended on apparatus and chemicals. All kinds of fuel are examined that may be sent in by railways, factories or private persons. The examination is chemical by analysis, physical by calorimetry, and mechanical by estimation of wearing and cohesive qualities.

The laboratory contains a Millot coarse crushing machine, a Peugeot mill and a smooth steel-grinders Millot mill. The cohesion machine is a sheet-iron cylinder 1 m. long and 92 cm. diameter. In it are three wings or ribs for lifting the fuel and dropping it. The various machines are electrically-driven. The drying room contains a frame carrying plates of 95 cm. by 63 cm. with upturned edges; on these plates samples are dried on arrival. Two small tabloid presses compress ground samples ready for the calorimeter. The tabloids weigh about 1 gramme. There are four calorimeters in a double-walled room. They consist of a platinum-lined bomb in a case of nickeled brass, with a stirrer, encased in turn in a vessel of copper, double walled. The thermometer is graduated to $\frac{1}{100}$° C., illuminated by a small lamp and read through a travelling lens. The room is generally illuminated by 50-c.p. tantalum lamps. A gas heater maintains the room at a constant temperature during the cold seasons, and a cooling apparatus is to be installed for the same end in the warmer seasons. Special attention is given to the regulation of the gas pressure at the meter, thus enabling flames to be maintained steady, whereby constant temperatures may be maintained at any crucible on any floor. Benches, gas, water and all subsidiary necessary appliances and apparatus are supplied.

Commercial oxygen is purified in a Berthelot incandescent copper oxide tube. Samples which arrive in air-tight cases are at once weighed and dried on the tared drying-room plates until their weight is constant. This determines rough moisture. Samples arriving in boxes, sacks, &c., are at once ground to pea size in the Millot mill, and then thoroughly dried for 48 hours. They are then ground to the fineness of sand in the Peugeot mill and to dust in the Millot roller mill in three or more passes, and being spread on a table are quartered down to 100 grammes. The remainder is sealed up and kept three months in case of need. Six 1-gm. tabloids are made from the finely-ground sample and sent to the calorimeter. Of the remainder, two 1-gm. samples are heated in a toluol drying oven to 103° C. for two hours. Ash is determined by heating 1 gm. in a platinum crucible for 1½ hours at 850° C. Volatile matter is determined by heating to 850° C. in a covered crucible until the little flame which issues at the small hole in the cover is extinguished. Calorific capacity is determined by the Berthelot method in a bomb filled with oxygen to 25 atmospheres. If the results of two determinations differ by more than 20 cals. a third or a fourth test is made. The combustible matter is determined for carbon, hydrogen, oxygen, nitrogen and sulphur. Specific gravity is measured. For liquid or gaseous fuel a Junker instrument is used for the calorimeter.

Briquettes are tested for cohesion in lots of 50 kg. in ½-kg. lumps in the cohesion drum, which is rotated 50 turns in two minutes. The material is then put on the gridiron, and the weight taken after shaking. This remainder should not be less than 55 per cent. The grid contains 20 bars 4 mm. thick, and 40 mm. apart. In the first year over 3,300 samples were examined, and progress is being made in the classification and general valuation of the many fuels which enter the country.

Electric Mail Service.—According to the Vienna correspondent of the *Daily Mail*, a project for the construction of a system of electric underground railways for the conveyance of letters and small parcels, to connect the 64 largest post offices, the central parcel office, and the principal railway termini of Vienna, is under consideration. The railway will have a total length of 47 miles. The tunnels will only be sufficiently large to accommodate the mail trucks, which are about 5 ft. high.

Tramway Sports.—On Wednesday afternoon, at the Brighton Railway Athletic Club Ground at Croydon, the annual sports of the Croydon Corporation Tramways Athletic Club took place.

A Lunatic as Lamp Salesman.—In March and April, 1908, advertisements appeared in various German technical papers wherein an engineer named Emil W—— announced:—

"W—— incandescent lamps save 50 per cent., burn 1,200 hours, and in any position, are not affected by current variations up to 10 volts. Wholesale price 2s. each for 110 or 230 volts, and 10 to 32 C.P., £7 10s. for 100 lamps, carriage and packing included, lamps broken on the way taken back, &c."

Several customers who were not pleased with the so highly recommended lamps received the answer:—"Although I distinctly advertise W—— lamps save 50 per cent. several of my customers understand this to mean saving in current, while current saving has never been mentioned. I speak only of saving in lamps."

The following communication, sent in by a subscriber of the *Electrotechnische Nachrichten*, in Leipzig, in which this article appeared, June 20th, may be of interest:—"We received a number of these lamps and tested them. They are ordinary incandescent lamps with the normal current consumption, worth about 3d. or 4d. each. We referred the matter to the Attorney-General, and received from him the following information:—'Have stopped proceedings against W—— as he has been declared to be insane and not responsible for his actions. Have suggested that precautionary measures be taken against the accused to protect the public from his dangerous doings. Until now he has avoided confinement in an asylum.'"

Cheating people with incandescent lamps seems to be quite a new and modern kind of madness, but we cannot help saying there is method in it.

Admiralty Electricians.—It is announced at Devonport that applications for entry in electricians' rating will be received by the Admiralty from able-bodied young men, of very good character, who are thoroughly efficient fitters and turners or instrument makers, with at least five years' practical experience. The age for entry is 21 to 28; minimum height, 5 ft. 4 in.; chest measurement, 21 and under 22, 34½ in.; 22 and under 23, 35 in.; over 23, 35½ in. The educational examination comprises sixth standard vulgar and decimal fractions, simple interest, dictation and reading. There is also a practical examination in fitting and turning or instrument making. The rates of pay, besides provisions, are as follows: On entry as electrician, fourth class, 38s. 6d. a week; advancing to electrician, third class, after three years' approved service, 40s. 3d.; advancing to electrician, second class, after seven years' approved service, 42s.; advancing to electrician, first-class, after 12 years' approved service, 45s. 6d.; chief electrician, second class, 49s.; advancing to chief electrician, first class, after six years' service in the preceding rating, 52s. 6d. Electricians, on completion of eight years' approved service, of which five must be at sea, are eligible, after examination, for advancement, as vacancies occur, to the rating of chief electrician.

A New Use for Electricity.—Electrical engineers in large supply stations are, or should be, perpetually on the lookout for every new device capable of quick sale which may be useful as an adjunct towards developing the consumption of electricity. Central-station engineers in America have already realised the importance to them of the rapidly growing use of motor-cars, both for passenger and heavy goods transport, as is seen by the fact that the Edison companies have in some instances established a complete series of charging stations for electric automobiles throughout their area. In this country, at any rate, it is found, however, that the petrol car is more generally used, and the electrical engineer has therefore to be satisfied for the present with the smaller possibilities afforded by the charging of ignition batteries and similar purposes. It is obviously to his advantage to necessitate the charging of such cells at more frequent intervals than at present, and therefore any device which extends the use of such batteries to a new field is of interest to him. In this connection the invention of Mr. F. J. Gornall, of Pilling, near Garstang, who is an expert in motor-car manufacture and maintenance, is of considerable interest, inasmuch as this invention constitutes a vulcanising instrument for the purpose of repairing cycle or motor-car tires.

When a motor tire cover or air tube is cut or burst, the only satisfactory means of effecting anything like a lasting repair, consists of filling up the resulting hole with raw rubber compound, and subjecting the part to regular and uniform heating at about 280° F. for about ½ hour, or until the rubber compound receives the tough elastic qualities characteristic of the remaining parts of the tire. This process of curing the raw rubber is termed "vulcanising," and is a function which a repair vulcaniser has to fulfil.

A vulcaniser for this purpose has essentially a metal surface, capable of maintaining the requisite temperature with suitable arrangements for clamping it in contact with the parts of the tire to be vulcanised. Machines for this purpose have been heated by gas flame, oil and spirit lamps, and occasionally by electricity. The main faults of hitherto existing machines have been the slowness with which the necessary heat has been obtained and the difficulty of regulating the heat, this latter point necessitating the use of a thermometer, or where steam was the heating medium, a steam gauge to record the pressure of steam used. With this invention the necessary heat is obtained in about three minutes, the result being made possible by the fact that the heat is not spread over a larger area than is absolutely necessary, being conserved strictly to the surface used for vulcanising. This economy of heat also renders it possible to generate the required temperature from current obtainable from the ordinary 4-volt ignition accumulator usually installed on motor-cars. The amount of electricity consumed from such an accumulator is about ½ ampere-hour for each square inch of surface repaired; hence an ordinary ignition accumulator will repair with one charge 60 sq. in. of surface, or 30 repairs of 2 in. each, costing about ½d. per repair.

The main difficulty met with in conducting the preliminary experiments was the regulation of the temperature. Owing to the fact that the material of the rubber tire is a non-conductor of heat, the intensity of the enclosed heat constantly increased when the machine was clamped to the tire. This difficulty is now overcome by using a certain quantity of iron wire which, as the result of increased temperature, acquires an increased electrical resistance. Hence at any given voltage the increase of resistance automatically limits the temperature rise. The chief points apparent in previous electric vulcanisers, due to waste of current by heating the whole of a large metallic machine and subsequent dissipation of heat and the great difficulty of obtaining a regular temperature, have been overcome by means of this new electric vulcaniser, and it should form a very satisfactory adjunct to the equipment of a motor-car, which in the long run benefits the supply of electricity to accumulator-charging stations.

The Rateau Patent System of Exhaust Utilisation.—Considerable progress is being made in the development in this country of the Rateau patent system of exhaust utilisation, and included amongst recent orders are those for a 500-KW. plant for the Barnsley Collieries of the Barrow Haematite Steel Co.; for a 500-KW. low-pressure turbine for the Coltness Iron Co., to use exhaust steam from Parsons high-pressure turbo exhausters; and for a 300-KW. exhaust steam turbine for Messrs. Stewarts & Lloyds, Coombs Wood Tube Works, Halesowen. Messrs. Burnyeat, Brown and Co. are also arranging for a Rateau patent heat accumulator for equalising the flow of steam from their winding engines, whilst the British Thomson-Houston Co. are going to install two accumulators for the Fife Coal Co., and one at the Earl Fitzwilliam's collieries, and a "repeat" order has been received from the Penrikyber Navigation Colliery Co. for one 1,250-KW. mixed pressure turbine recovering power from winding engines.

In addition to the foregoing, Messrs. Bolckow, Vaughan & Co. are adopting the "Rateau" system for an important installation at their Cleveland steelworks, Middlesbrough. In this instance, the exhaust steam from the steelworks is to be used in mixed pressure turbines, that is to say, turbines which operate normally on exhaust steam which has passed through Rateau patent heat accumulators, but which—in case of necessity—operate as live steam turbines on steam coming direct from the boilers admitted automatically for the high-pressure section of the turbine, are employed for driving Rateau patent turbo-blowers and turbo-alternators used for supplying blast to the furnaces at the Cleveland ironworks and electric power for the ironworks and steelworks. The order recently placed consists of two turbo-blowers, capable of generating a maximum output of 1,100 H.P., and of blowing 25,000 cb. ft. of free air per minute to a pressure varying at will from 6 to 10 lb. per sq. in. The compressors will be controlled by a specially-designed gear so that at all times the turbine speed is regulated by the pressure of the air in the delivery main, which is effected by one of Prof. Rateau's patents, under which, by a simple device, the air pressure in the delivery pipe is multiplied, so that it may more readily control the piston gear which actuates the steam admission valve. In addition to being under the control of the air pressure, the machines are, of course, fitted with a centrifugal governor, and in connection with this plant there will also be a large "Rateau" heat accumulator, capable of handling, at the outset, about 100,000 lb. of exhaust steam per hour, but provision will be made for further considerable extensions.

At their Auckland Park Colliery, County Durham, Messrs. Bolckow, Vaughan & Co. have recently arranged for a duplicate of the Rateau exhaust steam recovery installation laid down last year. The new turbine, instead of being of the low-pressure type (which, when the winding engines are not running, uses live-pressure steam reduced to atmospheric pressure in a reducing valve), is of the mixed-pressure type described above. The set is of 500-KW. capacity and includes a three-phase Siemens alternator, providing current at 2,400 volts and a periodicity of 60. Another example of the Rateau system being adopted for colliery use will be an installation, comprising a 750-KW. mixed-pressure turbine, lately contracted for by the Hulton Colliery Co.

Electrolytic Refining of Iron.—The possibility of electrolytically refining iron has not received the attention it deserves. Other metals are now being treated electrolytically on a fairly large scale, both in this country and abroad, and it is not likely that the commonest of all metals will be left out of the region of experiment. The work already done is very meagre, and has been chiefly in the hands of Burgess in America and Cowper-Coles in England. The latter metallurgist has gained many notable achievements in this field and still has experiments in hand. Now that some amount of success has been gained, new workers will certainly turn their attention in this direction, especially as there is a great demand for metals in a high state of purity. The latest contribution to this branch of electrochemistry comes from E. F. Kern, who has recently communicated the results of his experiments to the American Electrochemical Society. These experiments are divided into four groups, depending on the electrolytes used:—(*a*) Solution of ferrous sulphate; (*b*) solution of ferrous sulphate and sodium sulphate; (*c*) solution of ferrous chloride and sodium chloride; (*d*) solution of ferrous fluosilicate. Neutral ferrous fluosilicate electrolytes are not suitable for the electrolytic refining of iron, as they decompose slowly, with the separation of silica, which settles to the bottom of the cell and also collects in the anodes and cathodes. The deposit is brittle due to silica. Good deposits of iron were obtained from neutral solutions of ferrous sulphate containing 3 per cent. of sodium as sulphate or 4 per cent. as chloride. The voltage required is between 1·1 and

1·5 volts, but sinks considerably as the temperature rises. The deposits from neutral chloride solutions, however, were the best. The grain was finer and the metal more flexible. The latter is quite malleable at a red heat, and can be easily hammered double. When ammonium salts are added the deposits become more brittle, but more resistant to corrosion. These results are distinctly encouraging, and it is of interest to note that Burgess has been using the chloride method for several years in his laboratory for the continuous deposit of iron.

Firemen Poisoned by Sulphuric Acid Fumes.—While Mr. A. P. Strohmenger, analytical chemist, was experimenting with electric accumulators, the contents of a tank of nitric and sulphuric acid overflowed on to the floor, and the firemen were called. No fire occurred, but some hours afterwards eight officers and men were taken ill, and the condition of some of them was serious for a time.

Is "Chow" Chinese for "Juice?"—The following conversation in a Shanghai tramcar illustrates the Chinese view of electric traction :—

Passenger: "You savvey how fashion this tram walkee?"

Native Conductor: "O yes, Master, my savvey how fashion, topside have got one piece long bamboo; bamboo catchee chow, suppose no catchee chow, tram no can walkee."

We are informed by the correspondent who sends us this that "chow" stands for "food," and that the uneducated Chinaman seems to have the idea that anything in the shape of a pole must necessarily be bamboo. The analogy with "feeder" is clear. Perhaps some of our readers have not seen the comment of an Oriental on an electric car:—"No pushee, no pullee; go like hellee!"

The Manchester Exhibition.—In beautiful weather, and under exceedingly favourable conditions, the Exhibition building was on Tuesday opened to a large company of Press representatives and others, for a private view. The company met at the invitation of the Executive Committee, and had lunch with the latter.

The main building, which has a floor space of 100,000 sq. ft.—being 560 ft. long × 186 ft. wide—stands back from the Wilmslow Road about 150 yards, and has an imposing appearance from the main thoroughfare. It is easily accessible from the centre of the city by rail or tramcar. Situated close to the old-fashioned red-brick building known as Platt Hall, the ancestral home of the Platts and Carill-Worsleys, of Rusholme, and flanked by large and well-grown oaks and chestnuts, it has an inviting exterior, is pleasing in architectural design, and when lit up, as it is intended to be, nightly during the Exhibition, with myriads of coloured electric lamps, it will present a dazzling appearance. Though it is unfinished, the visitors could not fail to admire it as it stands, and congratulations were showered on the architects, Messrs. Davenport Bros., of Birmingnam, on the success of their work.

During the visit and at the luncheon, the visitors were furnished with some details of the structure and the purpose it is intended to serve.

The building will be well filled with machinery of every description; yet there will be room for 10,000 visitors at one time to inspect the exhibits with comfort. The main avenues are 10 ft. wide, the whole length of the interior. Twelve large emergency exits, which will enable the vast building to be cleared of its occupants in two or three minutes, safeguarding visitors against any kind of panic, and the building and its contents are to be amply insured.

Large dining rooms, tea-rooms, and a luxurious "lounge," where a thousand guests can be accommodated at once, will provide creature comforts, and all catering will be under the control of Mr. Deschamps, of the Palace Restaurant.

An Electrical Storm.—A violent atmospheric electrical disturbance took place last Friday and Saturday over a large area, being especially active in the London district. Friday was the hottest day of the year, so far as it has gone, but the storm brought down the temperature to less than normal. A house near Lowestoft was partially destroyed by lightning, the shock temporarily stunning many of the inmates. A Convalescent Home, on the highest point of Hampstead Heath, was set on fire, and a factory near Dartford was destroyed by fire following a lightning discharge. Many other buildings were more or less damaged, generally by fire. The tramway service between Dartford and Bexley Heath was stopped for several hours on Saturday. One death from lightning shock was recorded, and several persons received shocks. The frequency with which chimneys were struck is worthy of note.

Appointment Vacant.—Electrical tester for Gibraltar Dockyard.

Not a Coincidence.—We understand that the tenants who are in possession of part of the building purchased by the Institution of Electrical Engineers are the Society for Providing Homes for Waifs and Strays. Had the latter been the proprietors and the I.E.E. the tenants, the situation would have been most apt.

Electric Lighting Shares.—In the City of London Court on Tuesday, before his Honour Judge Rentoul, K.C., an action was brought by Mr. Arthur C. Brown, 129, Algernon Road, Lewisham, against Messrs. A. Everest & Co., stockbrokers, Broad Street House, E.C., to recover the sum of £41 11s. 3d., the value of five fully-paid ordinary shares in the St. James' and Pall Mall Electric Light Co., Ltd. Mr. Cartwright appeared for the plaintiff. Mr. Brown said he bought the shares and paid the defendants for them; but he could get neither his shares nor his money back. The defendants did not appear. Judge Rentoul, K.C., said he could not understand why the defendants did not deliver the shares. It seemed a stupid thing to do. Plaintiff: They send out circulars. Judge Rentoul said he must find for the plaintiff, with costs.

Institution and Lecture Notes.—The fortieth anniversary of Cornell University occurred on June 18th, and was celebrated by a very large gathering of Alumni; 99 students completed the course in electrical engineering, a number somewhat smaller than that of last year, when 107 completed the course. The curriculum in electrical engineering for next year has been modified, so that more time and attention will be devoted to the theory of the characteristic performance of electrical circuits and machines.

Society of Engineers.—A notice has been issued to members announcing the completion of negotiations with the Civil and Mechanical Engineers' Society, with a view to the amalgamation of the two bodies. The question has often been raised in the past, and since Mr. A. S. E. Ackermann became secretary of both bodies it has naturally been revived with success. It is hoped that the union will result in greater strength and usefulness in the future, and it is interesting to note that the Council proposes to adopt a "forward" policy whereby the interests of the individual members will be more effectively served than in the past.

Royal Society of Arts.—On Thursday last week the annual conversazione of the Society was held at the Natural History Museum. The guests were received by the chairman, Sir Stewart C. Bayley, and other members of the Council. A selection of music was performed by the string band of the Royal Artillery in the Central Hall, and a concert was given by a company of performers, under the direction of Mr. Harry Tipper, in the Reptilia Gallery; there was also an Auxeto-Gramophone Concert in the Bird Gallery, provided by the Gramophone Co., which aroused much interest and appreciation. A large number of guests were present, and enjoyed to the full the arrangements made for their entertainment.

Power Losses in High-Speed Belts. — Belting usually appears fairly efficient as seen running on pulleys of fair diameters, and at a velocity not too high, but no one can watch a belt running on the small pulley of a high-speed fan without realising that there must be a good deal of slip. In the *American Machinist*, particulars are given by Mr. A. S. Dickinson of the driving of a 10-in. pump pulley by a belt from a 15-in. motor pulley. The calculated pump speed was 1,275 R.P.M., but actually only 1,150 R.P.M. could be indicated. The belt was 8 in. wide, of double leather $\frac{1}{8}$ in. thick, and dressed to pliability for a week before the test, and it was slack enough to run with the top almost touching the lower side of the belt. The belt was nearly horizontal, so that it was in a position for maximum effect. The loss of power is obviously nearly 10 per cent. For loss due to rigidity of belt, an old formula for new double belts is quoted, which gives percentage lost $= \frac{400 \times c^2 (d + D)}{d \times D}$, where c is the belt thickness in inches, and d and D the diameters of the pulleys. This works out at 6·5 per cent., and the total loss is, therefore, about 16 per cent. Actual tests showed the loss to be 19·5 per cent., so that the formulæ are apparently not very far wrong. But neglected belts give much higher losses, and the loss in high-speed wood planers has been found as high as 60 per cent. The engines had been thought too small for their work, but attention to the belts showed that the engine was even excessive in power, so much smaller was the loss at the belts. Obviously the lesson to be learned is that belts must be kept pliable, and that they should not be run on pulleys of too small a diameter, the small pulley being not less than 50 belt thicknesses. Forty feet per second is the velocity given as a limit for the foregoing formulæ. This velocity is by no means the velocity of maximum capacity, but probably is high enough for small pulleys on which there is but little grip. Small pulleys are particularly unsuitable for thick belts, for the resistance to bending of the belt helps centrifugal force to keep apart the belt and the pulley. If a thick belt is called for because of strength, it should be in the form of two thin belts one over the other. Thus superposed, the strength of a thick belt without its faults is secured.

A New Form of High Resistance.—In the *Physical Review* Mr. G. W. Stewart describes a very convenient and satisfactory form of high resistance, in which a transparent lacquer called "Zapon" is employed. The lacquer consists of soluble cotton dissolved in certain mixed solvents, the chief ingredient of which is amyl acetate. When dry, there is left a film of pyroxyline, which is elastic, is not subject to ordinary changes in temperature, does not evaporate, does not crack, and is a good insulator. When lampblack is mixed with this lacquer and spread with a brush upon an insulator, a permanent and yet high resistance is obtained. The conductivity of the film can be easily regulated by the amount of lampblack used and the thickness to which the lacquer is spread with the brush. By trial, the author secured a variation in resistance from 3,000 to 3,000,000 ohms with a film approximately 3 mm. long and 2 mm. wide. In some experiments, resistances as high as 40,000 megohms are desired; with a film similar to the one just mentioned, it would be possible to secure this enormous resistance by a strip 0·2 mm. wide and 4 metres long. In securing permanency care must be taken to eliminate changes in the contact between the terminals and the film; this is done by making the terminals a part of the base itself. In some of the experiments, this condition was secured by making the terminals of copper plugs screwed into the rubber plate. Longden solved this difficulty by

making the terminals of deposited silver films. Two resistances made in January were found to have varied but 3 per cent. five months later. Films of less conductivity do not age so quickly. The variation is at first quite large, but grows smaller rapidly. Doubtless a process of ageing by baking would bring such films to a practically steady value at once. Of course a resistance which is composed of carbon particles held in position by a hardened film could in no case be as constant as a metallic resistance. With occasional calibration it would remain sufficiently constant for fairly accurate work.

The author found the variation to be less than one-half of 1 per cent. with a variation of voltage of 1,000 per cent. A number of observations were made through small ranges of temperature, and the results show a variation of from 0·1 to 0·15 per cent. per degree Centigrade. This figure will depend somewhat upon the base employed for the film, and consequently must be determined for each arrangement. Resistances of a few megohms might easily be enclosed in sealed tubes in order to obviate any variations due to moisture, as the resistances increase somewhat with increase in humidity.

Annual Outings.—The works of Messrs. H. W. Cox and Co., Ltd., will be closed to-morrow, Saturday, it being the occasion of the annual outing and dinner of the staff and employés, who will spend the day at Littlehampton.

The annual outing of the St. Marylebone Electricity Department took place at Margate on July 4th, and the event was very successful and enjoyable. A company of 69 sat down to dinner at the Terrace Hotel. The chair was taken by Mr. F. A. Wilkinson, resident engineer, supported by Mr. C. H. Smyth, mains superintendent, Mr. E. J. Jennings, secretary and accountant, and Mr. T. K. Richardson, station superintendent. Mr. Wilkinson proposed the health of the chief officers and success to the undertaking. The occasion was taken of presenting a case of pipes, subscribed for by the members of the department sick club, to Mr. Jennings, their hon. treasurer, on the occasion of his recent marriage.

The second annual staff outing of the Bermondsey Electricity and Destructor Works took place on Saturday last, June 27th, to Hastings. Dinner was held at the Waverley Commercial Hotel, with Mr. W. E. J. Heenan, borough electrical engineer, in the chair. The toast, "Mr. and Mrs. Heenan," given by Mr. A. E. Young, chief clerk, was received with musical honours, and Mr. Heenan, in responding, remarked on the success of the undertaking, the balance-sheet for the year just completed showing a net profit of £1,500. The weather being favourable, a most enjoyable day was spent.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—The Croydon T.C. has increased the salary of MR. E. A. FELLA, mains superintendent, from £190 to £230 per annum, by yearly increments of £10.

The Barnsley T.C. has granted the following increases of salary to officials at the electricity works:—MR. HIBBERT, assistant engineer, from £104 to £130 per annum; MR. MATTHEWS, assistant engineer, from £91 to £104; MR. CARR, assistant engineer, from £91 to £104; and MR. PICKERING, book-keeper, from £104 to £120.

The Warrington Electricity and Tramways Committee has resolved to appoint MR. H. B. JACKSON, chief assistant engineer, at a salary of £150 per annum, in succession to MR. PURSE, resigned. After consideration of the suggested re-arrangement of the duties of the engineer and tramways manager, the Committee has decided that the charge of car-sheds, upkeep of cars and the engineering work connected therewith, and the control of the men employed on the work, be transferred to the tramways manager without any increase of salary for six months; the salary of the engineer is to remain as at present. The Committee has also decided that MR. F. V. JORDAN be appointed mains engineer at £130 per annum, rising by £10 per annum to a maximum of £150.

The Dover T.C. has appointed MR. E. GREENHOUSE as the acting charge engineer at the E.L. works in succession to MR. J. E. DUDGEON, who has resigned.

MR. Z. H. KINGDON, late of Sheerness, has been appointed electrical engineer at Devonport Dockyard, vice MR. H. C. LEAKE, who has resigned.

The Public Lighting and Electricity Committee of the Eccles T.C. has recommended that the salary of the electrical engineer be increased from £300 to £350 per annum.

The Barrow Corporation Electricity Committee is retaining the services of MR. GRIFFIN-CHERNE as a canvasser for a further period of six months.

The Dewsbury T.C. has increased the salary of MR. W. E. ROGERS, assistant electrical engineer, from £150 to £170 per annum.

Last Saturday evening, at the Cattle Market Hotel, Stanley, a marble clock was presented to MR. J. W. CLOUGH, superintendent engineer of the Lister Drive Electric Power Station, Liverpool, by his fellow employés, on the occasion of his departure for Rugby to take up an appointment with the British Thomson-Houston Co.

At last week's meeting of the Barking Council, the resignation of MR. H. L. HOWARD, the electrical engineer, was received. It will take effect from July 31st.

Tramway Officials.—MR. J. R. GROVES, on leaving Peterborough to take over the management of the tramways at Worcester for the B.E.T. Co., has been presented with a silver afternoon tea service by the whist drivers of the city in recognition of his services to many charitable causes.

The Tramways Committee of Southampton T.C. has recommended that the salary of MR. SIMPSON, tramway traffic manager, be increased from £175 to £200 per annum, by £12 10s. per year.

On his retirement, MR. R. R. FAIRBAIRN, the manager of the Worcester Electric Traction Co., Ltd., was presented by the staff with a gift of Worcester porcelain, &c., at a sandwich supper given at the St. John's Depôt on Monday last week, after the last car had come in. Mr. Fairbairn, in responding to speeches, said that during 4½ years they had carried 10 millions of passengers without doing serious injury to anybody. This he described as a credit to Worcester motor-men. Later, in his remarks, he said that he was proud to have been the first tramway manager in the country to be elected to a City Council while in office.

Obituary.—A. G. H. TAYLOR.—We regret to announce the death of Mr. A. G. H. Taylor, assistant borough electrical engineer to the Durban Municipality, South Africa, which took place on June 6th, after a few days' illness, caused by blood poisoning. Mr. Taylor had been connected with the department since its inception in June, 1897, and was a most valued and capable official, and had endeared himself to all his colleagues, as was evidenced by the large attendance at the funeral, which took place on the following day.

W. H. HOLMES.—We regret to learn that the death occurred on Friday of Mr. Wm. Henry Holmes, a member of the firm of J. H. Holmes & Co., of Portland Road, Newcastle-on-Tyne. He was 84 years of age, and with his sons established the above-mentioned business in 1883.

The HON. HENRY MARSHAM, whose death occurred on Wednesday last week at the age of 63 years, was a director of the India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd. An attack of blood poisoning was the cause of death.

NEW COMPANIES REGISTERED.

Electric Taxicab Co., Ltd. (98,666).—This company was registered on July 3rd, with a capital of £300,000 in £1 shares, to carry on in London and elsewhere the business of proprietors of motor-cabs, cars, carriages and vehicles (particularly electric cabs), garage proprietors, electricians, electrical engineers, &c. The subscribers are:—Right Hon. Lord Westbury, 30, Hill Street, W., 200 shares; Sir David Lionel Goldsmid-Stern-Salomons, Bart., Bromhill, Tunbridge Wells, 200 shares; Sir Bache Cunard, Nevill Holt, Market Harboro', 200 shares; H. Willmott, Elmdon House, Rugby, general manager of Sheffield District Railway Co., 200 shares; W. M. Rolph, A.M.I.E.E., 30, Jermyn Street, S.W., 200 shares; C. L. Samson, 89, Gresham Street, E.C., solicitor, 200 shares; T. G. Chambers, 7, Hertford Street, Mayfair, W., managing director Electromobile Co., Ltd., 200 shares; W. C. West, 23, Marlborough Road, Wimbledon Park, clerk, 1 share; E. N. Ruddock, 23, Palace Road, Streatham Hill, S.W., electrical engineer, 1 share. Minimum cash subscription 60,000 shares; the first directors are Right Hon. Lord Westbury, Sir David S. Goldsmid-Stern-Salomons, Bart., Sir Bache Cunard, Bart., H. Willmott, W. M. Rolph, C. L. Samson, and T. G. Chambers; qualification, 200 shares; remuneration (except managing director), £250 each per annum (chairman, £500). Registered office, Dashwood House, New Broad Street, E.C.

Syndicate Lamp Co., Ltd. (98,588).—This company was registered on June 29th, with a capital of £2,000 in £1 shares, to adopt an agreement with the Metallfadenlam-penwerk, Berlin, G.m.b.H., and to carry on the business of manufacturers of and dealers in filament and other lamps, electricians, engineers, suppliers of electricity, &c. The subscribers (with one share each) are:—R. Hilditch, 16, John Dalton Street, Manchester, solicitor; J. Makin, Sunny Bank, Pine Road, Didsbury, wholesale jeweller; N. R. Stirling, Truro, Crescent Road, Blundellsands, Lancs., builder; T. D. Jones, Eastwood, Huyton, Lancashire, manager; G. R. Makin, 3, Chandos Road, Heaton Chapel, Lancashire, wholesale jeweller; H. B. Walton, 36, Spring Gardens, Manchester, chartered accountant; E. W. Barnaby, Cliff Cottage, Wilmslow, clerk. No initial public issue. The number of directors is not to be less than two or more than five; the subscribers are to appoint the first; qualification, £50. Registered office, 36, Spring Gardens, Manchester.

Hydro-Electrical Gear Co., Ltd. (98,608).—This company was registered on June 30th, with a capital of £6,000 in 5,000 participating cumulative preference shares of £1 each, and 20,000 deferred ordinary shares of 1s. each, to adopt an agreement with Col. Boddam, and to carry on the business of lift manufacturers, engineers, builders of machinery and electrical apparatus, &c. The subscribers (with one preference share each) are:—Col. E. T. Boddam, 8, Estelle Road, Hampstead, N.W.; H. R. Reynolds, 7, The Boltons, South Kensington, S.W., solicitor; W. P. Hewett, 14, Bedford Row, W.C., solicitor; R. P. Hornby, Wittingfield, Farnham Common, Bucks, solicitor; C. R. Cooledge, 14, Bedford Row, W.C., clerk; F. N. Reckitt, Trafalgar Buildings, Northumberland Avenue, W.C., architect; A. E. Goddard, 14, Bedford Row, W.C., clerk. No initial public issue. The first directors are Viscount Molesworth, C. E. Peczenik and R. P. Hornby; qualification (except first directors), 100 shares; remuneration, £125 each per annum (£25 extra for the chairman). Registered office, 11, Pancras Lane, E.C.

Chipping Norton and District Electric Light and Power Co., Ltd. (98,562).—This company was registered on June 29th, with a capital of £10,000 in £5 shares (1,000 preference), to acquire the undertaking and assets of the Chipping Norton Electric Light and Power Co., Ltd., and to carry on the business of an electric light and power company in all its branches. The subscribers (with one share each) are:—C. A. Bernard, 76, Finsbury Pavement, E.C., merchant; L. Gatrall, Kensworth, Ballock Road, Hither Green, S.E., printer; F. J. Cole, 97, Patriot Square, Cambridge Heath, E., stationer; F. Boulding, Glendower, Scrafton Road, Ilford, stationer; J. R. Smith, 190, Tufnell Park Road, N., clerk; C. F. Butcher, 25, Ballock Road, Catford, S.E., clerk; W. B. Murray Thomson, 221, Brecknock Road, Tufnell Park, N., cigar merchant. Minimum cash subscription, 10 per cent. of the shares offered to the public. The number of directors is not to be less than two or more than five; the subscribers are to appoint the first; qualification, 10 shares; remuneration as fixed by the company. Registered office, The Power Station, Chipping Norton, Oxon.

Paignton Electric Light and Power Co., Ltd. (98,437).—This company was registered on June 19th, with a capital of £15,000 in £1 shares, to acquire the benefits, rights, powers, authorities, obligations and liabilities of J. A. Purves, D.Sc., and W. T. Purves, M.A. (trading as the Western Electricity Corporation), under a Provisional Order granted in 1907 to the said parties under the Electric Lighting Acts, 1882 and 1888, in respect of the Urban District of Paignton and confirmed by the Electric Lighting Orders Confirmation (No. 3) Act of 1907, and to carry on the business of suppliers of electricity in all its branches. The subscribers (with 100 shares each) are:—W. J. Ham, San Clare, Paignton, gentleman; J. A. Burland, Ashleigh, Paignton; W. Lambshead, 1, Queen's Park, Paignton, provision dealer; J. N. Osborne, Glenholme, Paignton, draper; F. Sarson, Rycroft, Paignton, chemist; T. H. Ward, M.D., Sunny Croft, Paignton; R. Waycott, Marina, Paignton, auctioneer, &c. Minimum cash subscription £6,000 shares; the number of directors is not to be less than four or more than ten; the first are W. J. Ham, Maj.-General G. D'A. Jackson, T. H. Ward, M.D., J. A. Burland, L.R.C.P., R. Waycott, F. Sarson, W. A. Axworthy and J. N. Osborne; qualification, 100 shares; remuneration as fixed by the company. Registered office, 5, Palace Avenue, Paignton.

Bourne End Electric Installation Co., Ltd. (91,428).—This company was registered on June 19th, with a capital of £5,000 in £1 shares, to take over the business of suppliers of electric light and energy, engineers and fitters, carried on at Bourne End, Bucks. The subscribers (with one share each) are:—F. C. Frye, J.P., The Plat, Bourne End, Bucks; H. S. Wilton, 29, St. John's Wood Park, N.W., saddler; J. R. Collins, 19, Delamere Terrace, Paddington, W., manufacturer; H. Wetton, 20, Sebert Road, Forest Gate, clerk; H. C. Brannan, 145, Merrow Street, Walworth, S.E., shorthand writer; W. R. Chapman, 22, Vant Road, Tooting, S.W., accountant; E. R. Gibbs, 62, Davies Lane, Leytonstone, clerk. No initial public issue. The number of directors is not be less than two or more than four; the first are F. C. Frye (chairman), H. S. Wilton, J. R. Collins and W. P. Wilson; qualification, £50.

Chisholm, Gray & Co., Ltd. (98,465).—This company was registered on June 23rd, with a capital of £7,000 in £1 shares, to acquire the business carried on in Birmingham as the "Chisholm Manufacturing Co," to acquire the patents granted to A. Cripwell for improvements in electric switches, &c., to adopt agreements (1) with the said A. Cripwell and (2) with D. Whamond and the said A. Cripwell, and to carry on the business of brass-founders, electricians, manufacturers of electrical accessories, appliances and machinery, &c. The subscribers (each with one share) are:—G. Chisholm, 26, Langley Road, Small Heath, Birmingham, manufacturer; R. Gray, 45, Princess Road, Edgbaston, Birmingham, manufacturer; D. Whamond, 27, Snowdon Place, Stirling, manager; D. Clarke, 21, Langley Road, Birmingham, engineer; E. G. Chisholm, 26, Langley Road, Small Heath, Birmingham; T. Gardiner, Eastbourne, Mansel Road, Small Heath, Birmingham, manager; E. S. Maclaren, 1, Edgbaston Road, Mosley, Birmingham, clerk. No initial public issue. The number of directors is not to be less than two or more than four; the first are G. S. Chisholm (managing director) and R. Gray; qualification, 1 share; remuneration of G. S. Chisholm, not less than £250 per annum, with an increase of £25 per annum for four years; of other directors, as fixed by the company. Registered office, Providence Works, Fleet Street, Birmingham.

Bauxite Refining Co., Ltd. (98,531).—This company was registered on June 27th, with a capital of £100,000 in £1 shares, to carry on the business of manufacturers of and dealers in alumina or other materials or ingredients used in the production of aluminium, owners of mines and minerals, winners and workers of mineral substances, &c. The subscribers (with one share each) are:—C. J. Lunn, 17, Townsend Road, South Tottenham, clerk; W. Moir, 205, Queen's Road, Wimbledon, clerk; G. C. Pullman, St. Helens, Hampton Wick, clerk; A. G. Ratcliff, Moulton Settlement, City Road, E.C., clerk; H. Barnes, 351A, Wandsworth Road, S.W., clerk; W. Graham, 24, Coleman Street, E.C., solicitor; W. Newbert, 123, First Avenue, Manor Park, clerk. No initial public issue. The number of directors is not to be less than two or more than five; the first are the Hon. Sir James Sivewright, K.C.M.G., J. E. Davidson and R. S. Portheim. So long as the United Alkali Co., Ltd., or their nominees hold 1,000 shares they may appoint a director; qualification (except such director), £100; remuneration while only three directors, £500 per annum, divisible; when more than three, proportionate increase. Registered office, Pandon Building, Newcastle-on-Tyne.

Brown & Parsons, Ltd. (98,501).—This company was registered on June 25th, with a capital of £1,000 in £1 shares, to acquire the business carried on at 63, The Parade, Leamington, as "Brown & Parsons," and to carry on the business of electrical and mechanical engineers, manufacturers of electrical or other machinery, accessories and instruments, &c. The subscribers (with one share each) are:—R. H. Newton, 85, Hagley Road, Birmingham, electrical engineer; H. Robinson, Cadogan Chambers, Cherry Street, Birmingham, architect; G. H. Salmon, 432, Bearwood Road, Smethwick, secretary; Mrs. E. Brown, 1, Clonmore Street, Southfields, S.W.; C. J. Passey, 102, Filton Road, Small Heath, builder; F. E. Brown, 63, Parade, Leamington Spa, electrical engineer; H. B. Matthews, Dunleay, Victoria Road, Sutton Coalfield, engineer. No initial public issue. The number of directors is not to be less than three or more than five; the first are F. E. Brown (managing director) and two others to be appointed by the subscribers; remuneration of F. E. Brown, £156 per annum and 10 per cent. of the net profits, after 10 per cent. is paid on the ordinary shares. Registered by S. Mandale, 41-2, Temple Street, Birmingham.

J. P. Hall & Co., Ltd. (98,542).—This company was registered on June 27th, with a capital of £35,000 in £1 shares, to carry on the business of electrical and mechanical engineers and machinists, manufacturers of electrical and other apparatus and appliances, boiler and economiser makers, motor-car manufacturers, carriers of passengers and goods, &c. The subscribers (with five shares each) are:—J. P. Hall, Gorse Bank, Oldham, electrical engineer; A. G. Hall, Gorse Bank, Oldham, electrical engineer; Mrs. H. L. G. Duncuft, Hartford House, Oldham; J. Duncuft, Hartford House, Oldham, cotton manufacturer; Mrs. M. A. Hall, Toravon, Oldham; E. Trustram, 11, Clegg Street, Oldham, solicitor; A. E. Marland, 21, Werneth Hall Road, Oldham, secretary. No initial public issue; the number of directors is not to be less than two or more than six; the first are J. P. Hall and A. G. Hall (both permanent; special qualification, £500 shares); qualification of ordinary directors, £200; remuneration, £300 each per annum; registered by Waterlow Bros. & Layton, Ltd., Birchin Lane, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Windermere & District Electricity Supply Co., Ltd. (41,461).—This company's annual return was filed on May 1st, when 5,000 preference and 3,000 ordinary shares had been taken up out of a nominal capital of £50,000 in 5,000 preference and 5,000 ordinary shares of £5 each. £5 per share has been called up on 3,040 preference and 1,780 ordinary shares, resulting in the receipt of £23,850. £16,150 is considered as paid on 1,960 preference and 1,270 ordinary. Mortgages and charges: £20,000.

Folkestone Electricity Supply Co., Ltd. (51,825).—This company's annual return was filed on April 15th, when the entire capital of £100,000 in 20,000 shares of £5 each had been taken up and paid for in full. Mortgages and charges: £90,000.

Browett, Lindley & Co., Ltd. (63,128).—This company's annual return made up to April 10th, has been filed. 50,000 preference, and 50,000 ordinary shares, have been taken up out of a nominal capital of £120,000 60,000 preference, and 60,000 ordinary shares, of £1 each. £1 per share has been called up on 42,000 preference, and 23,478 ordinary shares, resulting in the receipt of £65,478. £34,522 is considered as paid on 8,000 preference, and 26,522 ordinary. Mortgages and charges: £30,000 debenture stock.

Bromley (Kent) Electric Light and Power Co., Ltd. (54,127).—This company's annual return was filed on May 14th, when 15,000 shares had been taken up out of a nominal capital of £100,000 in £5 shares. £75,000 has been received. Mortgages and charges: £70,000.

Okonite Co., Ltd. (69,327).—This company's annual return was filed on April 29th, when the entire capital of £120,000 in 32,000 preference, and 16,000 ordinary shares of £2 10s. each had been taken up. £595 has been paid on 100 ordinary and 110 preference shares, and £119,475 is considered as paid on the remainder. Mortgages and charges: £43,400 (but of these £32,400 debentures are in the hands of trustees for the company).

Chislehurst Electric Supply Co., Ltd. (50,980).—This company's annual return was filed on May 15th, when the entire capital of £15,000 in £5 shares had been taken up and paid for in full. Mortgages and charges: £10,000.

Birkdale District Electric Supply Co., Ltd. (70,259).—This company's annual return, made up to April 25th, was filed on June 11th. The entire capital of £30,000 in £5 shares has been taken up and paid for in full. Mortgages and charges: £3,000.

British L.M. Ericsson Manufacturing Co., Ltd. (79,061).—This company's annual return was filed on May 22nd, when 100,010 shares had been taken up out of a nominal capital of £200,000 in £1 shares. £1. per share has been called up on 50,010, and (?) 12s. per share on 50,000, and £70,010 has been received. £30,000 (12s. per share) is considered as paid on 50,000. Mortgages and charges: Nil.

Marconi International Marine Communication Co., Ltd. (65,759).—Issue on June 12th of £15,000 7 per cent. debentures, part of series created by resolutions of November 20th, 1905, and June 11th, 1908, to secure £40,000. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees. Previously issued of same series, £25,000.

Lancashire Dynamo and Motor Co., Ltd. (61,447).—This company's annual return was filed on June 12th, when 850 ordinary and 470 preference shares had been taken up out of a nominal capital of £150,000 in 1,000 ordinary and 500 preference shares of £100 each. £100 per share has been called up, and £132,000 has been received. Mortgages and charges at date of return, £53,500. A further £500 debentures were issued on June 3rd, 1908 (see below), and an additional £15,000 is held by bank as security for possible overdraft.

Issue on June 3rd of £500 5 per cent. first mortgage debentures, part of series created by resolutions of March 4th and June 24th, 1907, to secure £75,000, charged on two plots of land in Trafford Park, Manchester, containing about 10,946 and 5,300 square yards respectively, with the premises and machinery thereon and the company's other assets and undertaking, except uncalled capital. Trustees: E. F. Sheppard, 55, King Street, Manchester, and A. Tongue, 86, King Street, Manchester. Previously issued of same series: £68,000.

CITY NOTES.

Chili Telephone Co., Ltd.

THE directors' report for the year ended March 31st, 1908, states that the aggregate number of subscribers at all centres at the end of the year was 7,666, a gain of 551 for the year. The gross revenue in Chili from all sources was $1,469,611, an increase of $300,123; the expenditure in Chili was $744,121, an increase of $95,572; and the net income in Chili from all sources was $725,489, an increase of $204,551. The average rate of exchange for the year was 11·21d., as compared with 14·01d. in the previous year, giving a decrease for the year of 2·80d. Converted into sterling at these rates, the figures given above are £33,883, an increase of £3,469. The liquid assets and liabilities in Chili on March 31st, 1908, were valued at 8¾d., the current rate of exchange on that day, as compared with 12¾d., at which they were valued on the corresponding date of the previous year. The whole of the outstanding 6 per cent. debentures, amounting to £12,000, were redeemed on September 30th last. The balance to the credit of the revenue account, including £2,727 brought from the previous year, is £33,817, of which £13,440 has been carried to reserve. An interim dividend of 3s. per share, free of income-tax, was paid on January 15th last, and the directors now recommend a final dividend of 5s. per share, free of income-tax, leaving a balance of £2,777 to be carried forward. The total mileage was:—On March 31st, 1908, 13,496 miles 275 yd., an increase of 817 miles 1,289 yd.

The Electric Taxi-Cab Co., Ltd.

IN a prospectus which is now before the public, this company is inviting subscriptions for £300,000 in £1 shares, to enable it to put upon the London streets within two years 500 electric taxi-cabs—four-seated, and with luggage roof capable of carrying as much luggage as the ordinary four-wheeled cab. The Electromobile Co. will supply these cabs, or, at any rate, 100 of them, with chassis of substantially the same type as those used for their private carriages (see ELECTRICAL REVIEW, November 29th, 1907) for £360 each, exclusive of batteries, tires and taximeters. The Electromobile Co. will also supply the batteries (150) for the first 100 cabs at £60 per battery, but the new company will be at liberty to purchase batteries for the other 400 wherever they choose. It is expected that 100 of the cabs will be on the streets by March next, and pending the acquisition of suitable garage accommodation, the Electromobile Co. will provide such accommodation at their Mayfair garage, and be responsible for operating costs of any number up to 100. They are also under contract for three years to maintain the chassis and bodies, for the supply of electricity, and for the maintenance and replacement of the batteries. The prospectus estimates the following income and outgoings when the whole 500 cabs are run and garaged by the company itself, that is, we suppose, at the termination of the Electromobile three-years' contract, although as above, the aim is to get the 500 at work in two years:—

Gross earnings (average) per cab per day...			£2 0 0
Driver, per day (one per cab?)			7 0
			£1 13 0
Garage accommodation and operating costs ...	2s. 8d.		
Maintenance and up-keep of chassis and bodies, including lubricating oils and stores	2s. 8d.		
Electricity and maintenance and replacement of batteries	9s. 2d.		
Tires (supply and maintenance)	5s. 0d.		
Per cab	19s. 6d.		19 6
Profit per cab per day			13 6
For 500 cabs running six days per week, profit ...			£105,630
Taximeters rent will cost £3,500; licences, £1,375; insurance, £12,500; and provision as reserve for replacing the chassis and bodies in seven years (batteries and tires being maintained out of revenue), £23,490			40,865
Leaving available for administration expenses, directors' remuneration and further reserves			£64,765

The contract with the Electromobile Co. for garaging and running the first hundred cabs will for the time being involve payments which will reduce the profit per cab per day from 13s. 6d. to 11s., but this, it is considered, will be amply compensated for by avoiding the running in the early stage of a large only partially filled garage, and by the fact that the Electromobile Co.'s technical experience will be at the company's disposal. The company's charges for garaging will be £60 per cab per annum for the three years; for charging with electricity and renewing and maintaining the batteries, 3d. per mile run; and for maintaining chassis and bodies, £45 per cab per annum. The prospectus refers to the practical absence of depreciation with the electric carriage when the machine is properly maintained, and it states that many of the private carriages of the Electromobile Co. have been in constant service for over five years, "and they show now scarcely any sign of depreciation, whilst the freedom from breakdown is almost complete."

The directors will proceed to allotment on the subscription of 60,000 shares, exclusive of certain qualifications and other shares.

There can be no doubt whatever that the electrical vehicle by reason of its silent running, freedom from smell, smother and breakdown, will have little difficulty in securing the patronage of the public, and we wish every success to all who are making legitimate and well-considered efforts to ensure a profitable future for the electromobile.

Of course, in regard to this particular company everything depends upon the accuracy of the estimates as to both earning power and working expenses, and upon the extent to which depreciation arises in practice. The Electromobile Co. has had considerable practical experience in the running of electric carriages in London, and the above estimates of working expenses (made by Mr. Theodore G. Chambers, the managing director of that company) are based upon "minutely kept records of carriages which have actually run over 2,000,000 miles." So far as the maintenance and up-keep of the cabs is concerned, there would seem to us to be a considerable difference between holding the carriages available in the garages as the Electromobile Co. has done so far, and having them in continuous service on the streets for hire for over 300 days per annum, and in all weathers. The earnings are based upon the authorised tariffs for motor-cabs, and the statement is made that they "should not be less" than £2 per cab per day. It is impossible in the absence of statistics of the experiences of motor-cab companies to say whether this is a fair figure to reckon upon—we are inclined to regard it as far too liberal, though we should very much like to see it realised. We are tempted to wonder whether sufficient allowance has been made for cabs remaining idle on the road, particularly at certain hours of the day, and for some remaining idle in the garage while undergoing overhauling and repairs.

The board of the company is a strong one, and inspires confidence, including as it does Sir David Salomons, eminent both as a motorist and as a battery expert; Sir Bache Cunard, who is a tramway director and is on the board of the Chloride Co.; Mr. W. M. Rolph, chairman of Marples, Leach & Co. (who represent the Bergmann interests in this country); Lord Westbury (the chairman), Mr. C. L. Sampson, and Mr. T. G. Chambers, are all directors of the Electromobile Co., Ltd., and Mr. H. Willmott is a railway director of great experience and ability.

The list of applications closes to-day.

Greenwood & Batley, Ltd.—At the annual meeting, held in London on July 3rd, Mr. A. Greenwood referred to the considerable increase in work turned out, making the profit nearly twice what it was in the previous year, thus enabling them to provide for additional depreciation. Slackness was his description of the condition of the engineering and tool departments; the electrical engineering department also showed a falling off, though there they were fairly well employed. The chairman referred, among other matters, to the high price of fuel, and the anxiety which manufacturers felt at threatened legislation in regard to collieries. The increased burdens imposed by legislation, and in rates and taxes, made the prospects anything but hopeful for manufacturers, and unemployment must probably ensue.

Stock Exchange Notices.—Applications have been made to the Committee to appoint a special settling day in and to grant a quotation to—

America Telephone and Telegraph Co.—$100,000,000 4 per cent. convertible bonds.

And to allow the following to be quoted in the Official List:—

Calcutta Electric Supply Corporation, Ltd.—20,000 5 per cent. preference shares of £5 each, Nos. 100,001 to 120,000.

The Committee has appointed a special settling day as under:—

Tuesday, July 14th.—British Columbia Electric Railway Co., Ltd.—Further issue of £100,000 preferred ordinary stock.

And ordered the undermentioned to be quoted in the Official List:—

British Columbia Electric Railway Co., Ltd.—Further issue of £100,000 preferred ordinary stock.

Kaministiquia Power Co., Ltd.—Scrip (partly paid) for $1,325,000 30-year 5 per cent. gold bonds.

Montreal Street Railway Co.—£460,000 4½ per cent. sterling debentures of £100 each, Nos. 1 to 4,600, in lieu of the scrip now quoted.

Rangoon Electric Tramway and Supply Co., Ltd.—Further issue of 10,000 6 per cent. cumulative preference shares of £5 each, fully paid, Nos. 30,001 to 40,000.

Companies to be Struck off the Register.—According to the *London Gazette*, the following are to be struck off the Register within three months unless cause is shown to the contrary:—

Anti-Friction Roller Bearing Syndicate, Ltd.
Electrical Appliances Syndicate, Ltd.
Electrical Productions, Ltd.
Electro-Smelting Co., Ltd.
Helios Electrical Construction Co., Ltd.
Irish Electric Railways Co., Ltd.
North-West London Electric Supply Co., Ltd.
Uddingston District Electric Lighting Co., Ltd.
Western Smoke Consumer and Fuel Economiser, Ltd.

Marconi International Marine Communication Co., Ltd.—According to the *Financial Times* the balance-sheet of this company, at June 30th, 1907, shows the following items:—Debit—Issued capital, £204,056; debentures, £20,000; creditors, £23,269; total, £247,325. Credit—Plant, apparatus, &c., £13,163; office furniture, £1,093; consideration for licence and rights, £105,115; contract with Lloyd's Corporation, £977; shares in associated companies, £23,715; debtors, £4,397; cash, £34; balance of expenditure over receipts from incorporation of company to date, £98,831; total, £247,325.

Ross Electric Light and Power Co., Ltd.—The directors' report to December last showed that ten new consumers were added. The units sold for lighting increased from 22,913 to 25,112. Out of the available balances of £403, two years' dividend on the cumulative preference shares (to December, 1905) amounting to £89 had been paid, £100 has been written off preliminary expenses, and £200 off plant, £14 being carried forward.

Power Gas Corporation, Ltd.—A petition for reducing the capital from £350,000 to £300,000 is to be heard in the Courts on July 14th.

La Capital Traction and Electric Co. of Buenos Ayres, Ltd.—The directors have declared a dividend of 3½ per cent. on the ordinary shares for the 15 months ended March, 1908.

American Telephone and Telegraph Co.—A dividend of 2 per cent. for the past quarter has been declared.

Consolidated Electrical Co., Ltd.—A dividend on the ordinary shares of 3½ per cent., less income-tax, for the year ended March 31st is recommended. Last year the dividend was at the same rate.

Prospectuses.—*British Aluminium Co., Ltd.*—This company is offering an issue of £700,000 5 per cent. mortgage debenture stock at par. The list is to close to-day.

A correspondent says that an electric lighting company is being floated in Paignton, with a present issue of 9,500 shares of £1 each. Mr. W. J. Ham, J.P., C.C., is chairman of directors, Dr. Purves is consulting engineer, and Mr. J. R. Mill secretary.

Electrical Power Storage Co., Ltd.—A dividend of 5 per cent. on ordinary shares for the year ending May 31st is recommended, carrying forward £369. The volume of trade has somewhat decreased, owing to fluctuations in cost of materials and to general trade depression. Last year the dividend was 6 per cent., and the carry-forward £787.

Okonite Co., Ltd.—An interim dividend of 8 per cent. per annum, less income-tax, on the ordinary shares for the past quarter is recommended.

United Electric Tramways of Monte Video, Ltd.—It is intimated that the whole of the outstanding balance of 5 per cent. debenture stock of this company has now been sold completing the authorised issue of £800,000.

Hendon Electric Supply Co., Ltd.—Mr. C. F. Tufnell presided at this company's annual meeting, at Salisbury House, E.C., last week. He said that progress was being made with the mains-laying operations, and the erection of transformer stations in preparation for taking supply from the North Metropolitan Power Supply Co. For urgent needs a temporary generating station was put down.

Germany.—The Berliner Elektrischen Strassenbahnen Gesellschaft, of Germany, reports a net profit of £15,446 for the last financial year, which enables a dividend of 5 per cent. to be declared.

MARKET QUOTATIONS.

Wednesday, July 8th.

	CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a	Acid, Hydrochloric	per cwt.	5/-	..
a	,, Nitric	per cwt.	22/-	..
a	,, Oxalic	per cwt.	38/-	..
a	,, Sulphuric	per cwt.	5/6	..
a	Ammoniac, Sal	per cwt.	42/-	..
a	Ammonia, Muriate (crystal) ..	per ton	£33 10	..
a	,, ,, ...	per ton	£30	..
a	Bleaching powder	per ton	£5 10	..
a	Bisulphide of Carbon	per ton	£18	..
a	Borax	per ton	£16	..
a	Copper Sulphate	per ton	£22	..
a	Lead, Nitrate	per ton	£28	..
a	,, White Sugar..	per ton	£27	..
a	,, Peroxide	per ton	£32	..
a	Methylated Spirit	per gal.	2/6	..
a	Potassium Bichromate, in casks	per lb.	3½d.	..
a	Potash, Caustic (75/80 %) ..	per ton	£30	..
a	,, Chlorate	per lb.	3½d.	..
a	,, Perchlorate	per lb.	9d.	..
a	Potassium Cyanide	per lb.	7d.	..
a	Shellac	per cwt.	148/-	..
a	Sulphate of Magnesia	per ton	£4 10	..
a	Sulphur, Sublimed Flowers ..	per ton	£6 10	..
a	,, Recovered	per ton	£5 10	..
a	,, Lump	per ton	£5	..
a	Soda, Caustic (white 70 %) ..	per ton	£10 15	..
a	,, Chlorate	per lb.	3½d.	..
a	,, Crystals	per ton	£3 5	..
a	Sodium Bichromate, casks ..	per lb.	3d.	..
a	,, Cyanide (basis 100 %) ..	per lb.	7d.	..
	METALS, &c.			
b	Aluminium Ingots, in ton lots ..	per ton	£80	..
b	,, Wire, in ton lots ..	per ton	£130	..
b	,, Sheet, in ton lots ..	per ton	£128	..
a	Babbitt's metal ingots	per ton	£50 to £130	..
c	Brass (rolled metal 3" to 12") basis	per lb.	7⅛d.	..
c	,, Tube (brazed)	per lb.	8¼d.	..
c	,, ,, (solid drawn)..	per lb.	7¼d.	..
c	,, Wire, basis	per lb.	6¼d.	..
c	Copper Tubes (brazed)	per lb.	9⅛d.	..
c	,, ,, (solid drawn) ..	per lb.	9¼d.	..
g	Copper Bars (best selected) ..	per ton	£70	£2 dec.
g	Copper Sheet	per ton	£70	£2 dec.
g	,, Rod	per ton	£70	£2 dec.
e	,, (Electrolytic) Bars ..	per ton	£59 10	£1 dec.
e	,, ,, Sheets ..	per ton	£75	30/- dec.
e	,, ,, Rod ..	per ton	£64	£1 dec.
e	,, ,, H.C. Wire	per lb.	7⅞d.	⅛d. dec.
f	Ebonite Rod	per lb.	3/8	..
f	,, Sheet	per lb	3/-	..
n	German Silver Wire	per lb.	1/6	¼d. dec.
h	Gutta-percha, fine	per lb.	5/6 to 6/6	..
h	India-rubber, Para fine	per lb.	3/11½	3½d. inc.
i	Iron Pig (Cleveland warrants) ..	per ton	51/4	7d. inc.
l	,, Wire, galv. No. 8, P.O.qual.	per ton	£14	..
g	Lead, English Ingot	per ton	£13 to £13 5	inc.
m	Manganin Wire No. 28	per lb.	8/-	..
g	Mercury	per bot.	£8	..
d	Mica (in original cases) small ..	per lb.	6d. to 1/-	..
d	,, ,, ,, medium	per lb.	2/6 to 4/-	..
d	,, ,, ,, large ..	per lb.	4/6 to 8/6	..
p	Phosphor Bronze, plain castings	per lb.	1/- to 1/1½	..
p	,, rolled bars & rods	per lb.	1/2 to 1/3	..
p	,, ,, strip & sheet	per lb.	1/2½ to 1/5	..
o	Platinum	per oz.	100/-	..
c	Silicium Bronze Wire	per lb.	9d.	½d. dec.
r	Steel, Magnet, in bars	per ton	£55	..
g	Tin, Block (English)	per ton	£126 10 to £127 10	..
n	,, Wire, Nos. 1 to 16	per lb.	1/9	½d. dec.
p	White Anti-friction Metals—			
	"White Ant" brand	per ton	£34 to £58	..
k	Zinc, Sh't (Vieille Montagne bnd.)	per ton	£23	£1 dec.

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p The Phosphor Bronze Co., Ltd.
r W. F. Dennis & Co.

Hastings Tramways Co., Ltd.—The shareholders have just received a circular informing them that owing to the disappointing traffic receipts, attributed to the unseasonable weather, the directors regret they do not feel justified in making at the present time any payment on account of the preference dividend. The company has this week submitted a proposal to the Town Council for extending the tramway service through the old town by way of High Street, which will have to be widened at certain parts.

Jas. Keith & Blackman Co., Ltd.—A dividend of 5 per cent. on the ordinary shares is recommended. £1,000 is written off patents and goodwill, £1,854 is applied to extinguishing expenditure on patterns for new specialities, and £3,066 is carried forward.

Brush Electrical Engineering Co., Ltd.—This company held extraordinary general meetings on Tuesday, at which the resolutions printed on p. 30 of our last issue were passed.

STOCKS AND SHARES.

Tuesday Evening.

Stock markets generally, during the past week, have been very idle, many reasons including the "nineteen dayer," the fine weather, and Henley, being put forward to account for the slackness. Apart from a little reinvestment, among the "gilt-edged" category, of the dividend disbursements, there has been scant interest displayed in the course of markets all round the "House," and price movements are chiefly nominal. A reduction in the Bank Rate this week, anticipated in several quarters, would, no doubt, wake things up a bit, and start the ball rolling again, meanwhile business continues in a very "go-as-you-please" style, and members, like Mr. Micawber, are waiting for something to turn up.

Telegraphs have displayed a little more activity than last week, while our list records about an equal number of advances and shrinkages.

Amazon Debentures are 2 points up, and American 4 per cent. Bonds are 1 per cent. lower *ex* dividend. Anglo-American Preferred and Deferred have fluctuated and finish 1 and ¼ lower respectively. Direct Spanish Debentures have recovered their dividend deduction, and West Coast of America Debentures are nominally a point better *ex* dividend. National Deferred has been a bright spot showing a rise of 2, while Marconi's came in sellers and fell ⅛. Monte Video Ordinary are $\frac{1}{32}$ harder, and Westerns are ⅛ up.

Dealings in Electric Railway descriptions have been few and far between. Central London issues are unchanged on the week, but Metropolitan Consolidated stock has shed ½. Underground Profit Sharing Notes are 1 up.

Anglo-Argentine Tramways Second Preference have recovered their fall of $\frac{1}{16}$, and are steady at the current quotation. Auckland Trams Debenture and British Electric Traction Second Debenture have both gained a point.

Among Manufacturing concerns, British Insulated Ordinary and Preference record a rise of ¼ each, while Willans Preference have risen ⅛, the Debenture also improving to the extent of 2 per cent. Henley's Debenture was marked up 1 point.

British Aluminium 5 per cent. First Debenture and 5½ per cent. Loch Leven Debentures are both quoted 2 per cent. higher. This company has issued a prospectus, offering £700,000 5 per cent. Debenture stock at par, which, on the redemption of the above, will become a first mortgage on the property.

In the Electricity Supply division prices are well maintained, there being, however, but few actual advances in quotations to record. Although dealings are not numerous in this section, it compares very favourably with other markets, and the tone keeps quite good.

The announcement by the City of London Electric Lighting Company of an interim dividend at the rate of 5 per cent. per annum had no effect on the price of the shares. Metropolitans rose ½, as also did London Preference and Westminster Preference.

An issue of £100,000 4½ per cent. Debenture stock is contemplated by the South London Electric Supply Corporation, which company at present has only share capital. It will be remembered that the old 5 per cent. Debentures were paid off about 15 months ago. At that time prevailing conditions were not favourable to an immediate new issue being made, and a temporary loan from bankers was resorted to.

City of London Electric Lighting Co., Ltd.—The directors have declared the following dividends on account of the distribution for the year ending December 31st, 1908:—6s. per share on the preference shares, being at the full rate of 6 per cent. per annum for the half-year ended June 30th, 1908. 5s. per share on the ordinary shares, being at the rate of 5 per cent. per annum for the same half-year. These dividends will be subject to the deduction of income-tax, and will be payable on or after August 1st. Last year the interim dividends were at the same rate.

National Telephone Co., Ltd.—The directors, subject to the final audit, recommend the following dividends for the half-year ending June 30th last, after payment of the dividends on the preference shares:—At the rate of 6 per cent. per annum on the preferred stock. At the rate of 6 per cent. per annum on the deferred stock, less income-tax, carrying £140,000 to the reserve, and about £10,000 forward. The transfer books of the company will be closed from the 10th to the 23rd inst., both days inclusive, and the dividend warrants will be posted on the latter date.

Great Northern Telegraph Co.—An interim dividend of 5s. per share, less income-tax, for the past half-year has been declared.

Bayliss, Jones & Bayliss, Ltd. and Reduced.—A petition to the Courts for confirming the reduction of the capital of this company, by cancelling 10,000 ordinary shares of £10 each, is to be heard on July 18th.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations June 30th.	Closing Quotations July 7th.	Business done week ended July 7th, 1908. Highest	Lowest.	Rise + or Fall −	Present Yield per cent.
												£ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	2 — 3	2 — 3	..	..	..	Nil
143,300	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	Nil	5 %	5 %	5 %	83 — 86 xd	85 — 88	..	..	+2	5 13 8
$131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7¼%	7¼%	8 %	8 %	120 —124	120 —124	..	..	..	6 8 9
53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	90 — 93	90 — 92 xd	..	..	−1	4 7 0
598,180	Anglo-American Telegraph	Stock	2⅞%	3⅛%	3⅛%	3⅛%	58 — 61	58 — 61	..	..	..	5 14 9
3,200,910	Do. do. do. 6 % Pref.	Stock	5⅝%	6 %	6 %	6 %	103½—104½	102½—103½	103½	102½	−1	5 15 11
3,200,910	Do. do. do. Deferred	Stock	Nil	Nil	1⅜%	1 %	15½— 16½	15½— 16	15¾	15⅝	— ½	6 5 0
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	99 —102	99 —102	..	..	..	4 18 0
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	8 %	7½— 7⅞	7¾— 7⅞	..	..	..	5 3 3
2,383,376	Commercial Cable Stng. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	83 — 86 xd	83 — 86	85½	84	..	4 18 0
16,000	Cuba Telegraph	10	5 %	5 %	5 %	..	7½— 8½	7½— 8½	..	..	..	5 17 8
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	15½— 16½	15½— 16½	..	..	..	5 19 5
12,931	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	3 — 3½	3 — 3½	..	..	..	6 3 1
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8 — 9	8 — 9	..	..	..	5 11 1
30,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	100—103	100 —103	..	..	..	8 14 10
60,710	Direct United States Cable	20	3½%	4½%	4½%	..	13⅜—14½	13⅜— 14½	14	13⅜	..	6 10 9
50,900	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	98 —100 xd	98 —100	..	..	..	4 10 0
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	7 %	133 —136	133 —136	135	133½	..	5 2 11
2,000,000	Do. 5½ % Pref. Stock	100	5½%	5½%	5½%	5½%	84½— 86½	84½— 86½	..	..	..	4 0 11
1,896,706	Do. do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	100½—102½	101 —103	102½	101½	+ ½	3 17 8
300,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	7 %	12½— 13½	12⅝— 13⅛	13⅛	12¾	..	5 5 8
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	100½—102½	100½—102½	102	101½	..	3 18 1
269,700	East & S. Afric. Tel., 4 % Mt. Db., 1 to 8,000, red. 1909	100	4 %	4 %	4 %	4 %	101 —103	101 —103	101	..	..	3 17 8
200,000	Do. 4 % Reg. M. Debs. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
181,127	Globe Telegraph and Trust	10	5⅝%	5⅝%	5⅝%	5⅝%	10⅜— 10⅞	10⅜— 10⅞	10¹¹/₁₆	..	..	5 8 9
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	6 %	13⅜— 14⅜	13⅜— 14⅜	13¹⁵/₁₆	13¹¹/₁₆	..	4 4 11
150,000	Great Northern Telegraph, of Copenhagen ..	10	24 %	24%	20 %	20 %	27½—29½	27 — 29 xd	..	..	— ½	6 17 11
19,600	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	98 —100 xd	98 —100	..	..	..	4 10 0
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	13 %	54 — 57	54 — 57	..	..	..	5 14 0
$41,380,400	Mackay Companies Common	$100	1 %	2 %	3½%	4 %	60 — 70	60 — 70	..	..	..	5 14 4
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	60 — 70	60 — 70	..	..	..	5 14 4
384,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	Nil	1/16— 1/16	1/16— 1/16	8/-	6/3	— ⅛	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	4 %	5 %	6 %	6 %	1/32— 1/32	1/16— 1/16	19/9	..	..	4 14 1
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	3/32— 3/32	3/32— 3/32	..	..	..	5 12 11
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	108⅝—110⅝	108⅝—110⅝	110	108⅝	..	5 8 7
3,725,000	Do. do. Def. Stock	100	5 %	5 %	5 %	6 %	113 —115	115 —117	116	113	+2	5 2 7
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½— 12½	10½— 12½	..	..	..	4 16 0
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	5 %	5 %	10½— 12½	10½— 12½	..	..	..	4 0 0
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅝— 5⅞	5⅝— 5⅞	5¹⁵/₁₆	..	..	4 8 11
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	98 —100 xd	98 —100	98⅜	..	..	3 10 0
1,716,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	100½—102½ xd	100½—102½	102	100½	..	3 18 1
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	6¾%	7 %	7 %	8 %	1½— 1⅝	1½— 1⅝	..	..	..	5 16 4
50,000	Do. do. do. 6 % Cum. Pref.	1	6 %	6 %	6 %	6 %	1⅜— 1½	1⅜— 1½	..	..	..	4 18 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	..	4 %	4 %	4 %	88 — 91 xd	88 — 91	..	..	..	4 7 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	97 —100 xd	97 —100	..	..	..	4 0 0
11,889	Reuter's	8	5 %	5 %	5 %	5 %	7½— 8½	7½— 8½	..	..	..	4 14 1
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	..	4½%	4½%	4½%	97 —100 xd	97 —100	..	..	..	4 10 0
3,083	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	..	..	..	4 12 4
100,000	United River Plate Telephone	5	8 %	8 %	8 %	8 %	6⅜— 6⅞	6⅜— 6⅞	6¹¹/₁₆	6⅜	..	5 16 4
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5 — 5⅛ xd	5 — 5⅛	..	..	..	4 15 3
30,008	W. Coast of America, 1 to 30,000 & 53,001 to 58,008	2	Nil	Nil	2½%	..	1⅞— 1⅞	1⅞— 1⅞	..	..	..	3 10 2
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	99 —102	98 —101 xd	..	..	..	3 19 3
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980 ..	10	7 %	7 %	7 %	..	13⅜— 13⅞ xd	13⅜— 14	13⅞	13¹¹/₁₆	+ ⅛	5 0 0
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	99½—101½ xd	99½—101½	99½	..	..	3 18 10
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	⅜— ⅝	⅜— ⅝	..	..	..	Nil
84,568	Do. do. 6 % Cum. 1st Pref.	10	6 %	5 %	8 %	6 %	8½— 8¾	8½— 8¾	..	..	..	6 17 2
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	Nil	£2 6 0	8½— 9½	8½— 9½	..	..	..	2 9 0
80,000	D do. 5 % Debs., Nos. 1 to 1,600 ..	100	5 %	5 %	5 %	5 %	99 —102 xd	99 —102	..	..	..	4 18 0

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

320,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,007	5	8 %	8 %	8 %	9 %	8⅜— 8⅝	8 7/16— 8 11/16	8⅝	8 7/16	..	5 4 4
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5½%	5½%	5½%	5½%	6¼— 6⅝xd	6¼— 6⅝	6 7/16	6 1/16	..	4 10 2
266,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	138 —143 xd	138 —143	141	..	..	4 8 11
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	102 —105 xd	103 —106	..	..	+1	4 14 4
880,000	Babcock & Wilcox, 1 to 880,000	1	20 %	20 %	20 %	20 %	3½— 4	3½— 4	80/-	78/9	..	5 0 0
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 1/16— 1 1/8	1 1/16— 1 1/8	..	..	..	3 16 10
40,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	7 %	3 — 3½	3 — 3½	61/3	60/-	..	10 0 0
40,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	4 — 4½	4 — 4½	..	..	..	7 15 7
20,000	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	4½— 5½	4½— 5½	..	..	..	5 14 3
20,000	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3½— 4½	3½— 4½	..	..	..	4 14 1
288,300	Do. do. 5 % 1st Mort. Deb. Stock Red.	Stock	5 %	5 %	5 %	5 %	104 —108	106 —110	..	..	+2	4 10 11
800,000	Do. do. 5½ % Loch Leven Debs. ..	100	..	..	5½%	5½%	97 —100	99 —102	98	..	+2	5 7 10
400,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	6 %	8 %	125 —130	125 —130	..	..	..	6 2 2
800,000	Do. 5 % Pref. Ord. Stock	100	5 %	5 %	5 %	5 %	108 —112	108 —112	107½	107	..	4 9 3
800,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	107 —111	107 —111	..	..	..	4 17 1
288,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
290,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	101 —104	101 —104	101½	100½	..	4 6 2
188,301	British Electric Traction	10	6 %	3 %	Nil	Nil	1⅜— 1⅞	1⅜— 1⅞	30/-	22/6	..	Nil
161,437	Do. do. 6 % Cum. Pref.	10	6 %	6 %	6 %	3 %	4½— 4¾xd	4½— 4¾	91/3	88/9	..	6 6 4
1,473,553	Do. do. 5 % Perp. Deb. Stock	Stock	5 %	5 %	5 %	5 %	94 — 97	94 — 97	96⅜	96	..	5 3 1
598,986	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	75 — 77	76 — 78	76½	76	+1	5 14 3
100,000	British Insulated and Helsby Cables	5	8 %	8 %	10 %	..	5¾— 6¼	6 — 6¼	..	..	+ ¼	3 8 7
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	5¾— 6¼	6 — 6½	6⅜	..	+ ¼	4 16 0
500,000	Do. do. 4½ % 1st Mort. Deb. Red. ..	100	4½%	4½%	4½%	4½%	100 —103 xd	100 —103	..	..	..	4 7 5
212,000	British Thomson-Houston 4½ % 1st Mort. Debs.	100	4½%	4½%	4½%	4½%	93 — 98	93 — 98	..	..	..	4 11 10
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	Nil	7/16— 11/16	7/16— 11/16	..	..	..	Nil
1,016,858	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	48 — 48 xd	48 — 48	..	..	..	8 6 8
50,000	Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	Nil	9/16— 11/16	9/16— 11/16	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	Nil	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
105,731	Brush Electrical Engineering, Ord., 1 to 105,731 ..	2	Nil	2½%	Nil	Nil	0— ½	0 — ½	..	..	..	Nil
150,000	Do. do. Non-cum. 6 % Pref.	2	6 %	6 %	Nil	Nil	3/16— 7/16	3/16— 7/16	5/-	..	..	Nil
195,000	Do. do. 4½ % Perp. Deb. Stock	Stock	4½%	4½%	4½%	4½%	70 — 75	70 — 75	..	..	..	6 0 0
195,000	Do. do. 4½ % Perp. 2nd Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	53 — 58xd	53 — 58	..	..	..	7 15 2
100,000	Buenos Ayres & Belgrano, 1 to 100,000 ..	5	4 %	3 %	3 %	..	4¼— 4½	..	..	..	..	3 1 6
40,000	Do. do. "A" 6 % Cum. Pref., 1 to 40,000	5	6 %	6 %	6 %	6 %	4¼— 5¼xd	..	..	..	..	5 17 1
27,500	Do. do. "B" do., 1 to 27,500	5	6 %	6 %	6 %	6 %	4¼— 5¼xd	..	..	..	..	5 17 1
136,400	Do. do. 5 % Deb. Stock	100	5 %	5 %	5 %	5 %	110 —116 xd	..	..	..	..	4 6 2
190,000	Do. do. 5 % 2nd Deb. Stock	100	5 %	5 %	5 %	5 %	102 —105 xd	..	..	..	..	4 15 5
137,610	Calcutta Trams, 1 to 137,610	5	8 %	8 %	8 %	6 %	5⅜— 5⅝	5⅜— 6⅛	6⅛	..	..	4 14 1
30,000	Do. 5 % Cum. Pref., Nos. 1 to 29,830 ..	5	..	5 %	5 %	5 %	5 — 5¼xd	5 — 5¼	..	..	..	4 13 0
850,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	101 —104 xd	101 —104	..	..	..	4 6 7
35,000	Callender's Cable Construction shares	5	12½%	15 %	15 %	15 %	9¼— 10¾	9¼— 10¾	..	..	..	7 2 10
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	5¼— 5¾xd	5¼— 5¾	..	..	..	4 5 11
300,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	105 —107 xd	105 —107	..	..	..	4 4 1
491,232	Cape E Trams., 1 to 491,232	1	5 %	Nil	Nil	Nil	1 3/16— 1 5/16	1 3/16— 1 5/16	3/9	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	4 %	6 %	8 %	12 %	1 1/16— 1 1/8	1 1/16— 1 1/8	..	..	..	8 14 7
215,045	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
1,898,610	Central London Railway, Ord. Stock	Stock	4 %	4 %	4 %	3 %	75 — 78	75 — 78	77	75	..	3 16 11
553,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	90 — 92	90 — 92	..	..	..	4 7 0
553,195	Do. do. Def. do.	Stock	4 %	4 %	4 %	2 %	55 — 58	55 — 58	57	56½	..	3 9 0
1,480,000	City and South London Railway	Stock	2⅝%	1⅞%	3⅛%	2⅝%	38 — 40	38 — 40	39½	38⅝	..	5 [illegible]

Unless otherwise stated, all shares are fully paid. † A period of nine months. ‡ From Manchester Share List.

Continued on next page

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations June 30th.	Closing Quotations July 7th.	Business done week ended July 7th, 1908. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d
85,000	Crompton & Co., Nos. 1 to 85,000	8	2½%	2½%	5 %	5 %	1⅝— 1⅞	1⅝— 1⅞	..	..	..	8 0 0
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	92 — 95	90 — 93 xd	..	..	..	5 5 11
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1¼— 1⅜	1¼— 1⅜	..	..	..	7 5 5
805,000	Do. do. 6 % Cum. Pref., 1 to 805,000	1	6 %	6 %	6 %	6 %	1 — 1⅛	1 — 1⅛	21/10½	21/3	..	4 16 0
282,580	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	99 —102 xd	99 —102	..	..	..	4 18 2
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6%	6 %	6%	12½— 13½	12½— 13½	..	..	..	4 7 3
59,987	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	12½— 13½	12½— 13½	..	..	..	4 7 3
99,261	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,261	5	2½%	4½%	4½%	4½%	— —	— —	..	..	..	16 15 0
17,139	Do. "A" shares, 01—017,139	5	2½%	4½%	4½%	4½%	⅛— ¼	⅛— ¼	..	..	..	8 6 9
319,475	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	76 — 79 xd	76 — 79	..	..	..	5 1 3
72,220	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	85 — 87	85 — 87	..	..	..	5 14 11
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	⅛— ¼	⅛— ¼	..	..	..	Nil
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390..	2	7 %	7 %	Nil	Nil	1⅛— 1½	1⅛— 1½	..	..	..	Nil
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	5 %	7½— 8 xd	7½— 8	..	..	..	6 5 0
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	87 — 90	87 — 90	..	..	..	4 8 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	4 %	⅛%	⅛— 1½	⅛— 1½	..	..	..	3 6 8
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10½— 10¾	10½— 10¾	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	..	102 —103	102 —104	..	..	..	4 17 1
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15 %	15%	15 %	15%	10½— 11½	10½— 11½	10⅜	..	..	8 18 10
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5 — 6⅛	5 — 6⅛	..	..	..	4 1 10
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	104 — 106	105 — 107	..	..	+1	4 4 1
50,000	India-Rubber, Gutta-percha & Telegraph Works..	10	5 %	10%	10 %	..	15½— 16½	15½— 16½	..	..	..	6 1 3
37,500	†Liverpool Overhead Railway, Ord.	10	1½%	Nil	Nil	⅜%	1⅜— 1⅝	1⅜— 1⅝	..	..	..	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	5½— 6½	5½— 6½	..	..	..	8 0 0
600,070	London United Trams. (1901), 1 to 50,007	10	6 %	3 %	3 %	..	6½— 6⅝	6½— 6⅝	..	..	..	4 8 11
399,930	Do. do. 50,008 to 100,000	10	6 %	3 %	3 %	..	6½— 6⅝	6½— 6⅝	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	5 %	7 — 8 xd	7 — 8	7⅞	7½	..	6 5 0
1,331,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	79 — 84 xd	79 — 81	..	..	..	4 15 3
5,732,062	Metropolitan Consolidated	100	3 %	2⅜%	1 %	⅜%	39 — 40	38½— 39½	39½	37⅜	— ½	1 5 4
2,640,914	Do. Surplus Lands	100	2⅜%	2⅜%	2⅜%	2⅜%	68 — 70	68 — 70	69½	69	..	3 18 7
3,285,000	Do. District	100	Nil	Nil	Nil	Nil	12 — 13	12 — 13	12⅝	12	..	Nil
314,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	..	1/32 — 5/32	1/32 — 5/32	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	11/32 — 13/32	11/32 — 13/32	..	..	..	6 3 1
350,000	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	93 — 96 xd	93 — 96	..	..	..	4 13 9
245,500	Potteries E. Tro.	1	5 %	4 %	4 %	4 %	1/32 — 3/32	1/32 — 3/32	..	..	..	8 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	1/32 — 3/32	1/32 — 3/32	..	..	..	6 13 4
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	93 — 96	93 — 96	..	..	..	4 13 9
37,350	Telegraph Construction and Maintenance	12	15 %	15 %	15 %	17½%	31 — 33	31 — 33	32½	31½	..	6 5 0
150,000‡	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	102 —104	100 —102 xd	..	..	..	3 18 5
3,599,200	Undergd. E. R., Lon., 5 % Profit Shar. S. Nts.	..	5 %	5 %	5 %	5 %	39 — 43	40 — 44	42⅛	42	+1	11 7 4
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	Nil	Nil	10 %	3/32 — 1/4	3/32 — 1/4	..	..	..	8 0 0
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	Nil	Nil	..	6 %	8⅛— 8⅜	8⅛— 8⅜	70/-	..	..	8 6 5
46,404	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	70 — 74	72 — 76	72	..	+2	5 5 3

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P,. 1 to 15,000	5	5⅓%	5⅓%	5⅓%	5⅓%	4⅞— 5	4⅞— 5	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	94 — 97	94 — 97	..	..	..	4 10 11
30,131	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10 %	10%	10 %	7 — 8	7 — 8	..	..	..	6 5 0
2,869	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	6¾— 7¼	6¾— 7¼	..	..	..	4 10 4
396,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	98 —101	98 — 101	..	..	..	3 19 3
80,000	Charing Cross and Strand Electricity Supply	5	8 %	5 %	5 %	5 %	3⅞— 4⅛	3⅞— 4⅛	..	..	..	5 17 8
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4⅛— 4⅜	4⅛— 4⅜	..	..	..	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3⅞— 4⅛ xd	3⅞— 4⅛	..	..	..	5 17 8
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	95 — 98	95 — 98	96½	95	..	4 1 8
49,486	Chelsea Electricity Supply, Ord.	5	6 %	6 %	4½%	4½%	3 — 3⅛	3 — 3⅛	..	..	..	6 8 7
175,000‡	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	99 —102 xd	99 —102	..	..	..	4 8 3
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	9⅞— 10⅛	9⅞— 10⅛	..	..	..	5 14 3
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12 — 13	12 — 13	12⅝	12½	..	4 12 4
400,000‡	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	122 —125 xd	122 —125	..	..	..	4 0 0
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	100 —103 xd	100 —103	..	..	..	4 7 5
40,000	County of Durham Electrical Power, Ord.	5	£8 7 0	4 %	4 %	2 %	2⅛— 3	2⅛— 3	..	..	..	3 6 M
50,000	Do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	3⅞— 4⅛	3⅞— 4⅛	..	..	..	5 17 8
40,000	County of London Electric Lighting, Ord. 1—40,000	10	4½%	5 %	5 %	5 %	7⅞— 8⅛	7⅞— 8⅛	..	..	..	6 1 3
40,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10⅜— 10⅝	10⅜— 10⅞	10⅜	..	..	5 9 1
400,000‡	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	105 —108 xd	105 —108	..	..	..	4 3 4
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	98 —101	98 —101	99½	98½	..	4 9 1
80,000	Edmundson's Electric Corporation, Ord. Shares	5	7 %	4 %	Nil	Nil	1/32 — 3/32	1/32 — 3/32	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	3 %	Nil	⅛— 1	⅛— 1	..	..	..	Nil
433,000	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	68 — 73	63 — 73	68	..	..	6 3 3
10,000	Folkestone, 1 to 10,000	5	5⅓%	5⅓%	5⅓%	5⅓%	4⅜— 5⅛	4⅜— 5⅛	..	..	..	5 4 9
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	..	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 10 11
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	95 — 98	96 — 99	..	..	+1	4 10 11
15,000	Hove, 1 to 15,000	5	8⅓%	9 %	9 %	8⅓%	6 — 6½	6 — 6½	..	..	..	6 10 9
21,000	Kensington and Knightsbridge Electric Ord.	5	12 %	10 %	10 %	10 %	8 — 9	8 — 9	..	..	..	5 9 7
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	96 — 99	96 — 99	..	..	..	4 0 10
10,000	London Electric Supply Corporation, Limited, Ord.	3	3 %	4 %	4 %	2½%	⅞— 1⅛	⅞— 1⅛	..	..	..	5 8 1
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	4⅜— 4⅝	4½— 5	96/3	92/6	+ ⅛	6 0 0
74,895	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4 %	4 %	4½%	89 — 92	89 — 92	..	..	..	4 17 10
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	10 %	8 %	6½%	4⅛— 5	4⅝— 5⅛	..	..	+ ⅛	5 15 7
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅝— 4⅞ xd	4⅝— 5⅛	..	..	..	4 12 4
220,000‡	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	105 —109 xd	105 —109	..	..	..	4 2 7
250,000‡	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	84 — 89 xd	84 — 89	..	..	..	3 18 8
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	94 — 97 xd	94 — 97	..	..	..	4 12 9
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	8 %	5½— 6	5½— 6	..	..	..	6 13 4
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	5 %	5½— 6	5½— 5¾	5½	..	..	4 3 4
10,852	Notting Hill Electric Lighting	10	7 %	7½%	7½%	7½%	12 — 13 xd	12 — 13	..	..	..	5 15 5
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	7 %	5⅝— 6½	5⅝— 6½	..	..	..	5 12 0
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	94 — 98	95 — 99	..	..	+1	4 0 10
40,000	St. James' and Pall Mall Electric Light, Ord.	5	14½%	12½%	10 %	10 %	7½— 8½	7½— 8½	..	..	..	5 17 8
20,000	Do. do. 7 % Pref. 20,001 to 40,000	5	7 %	7 %	7 %	7 %	6¾— 7¼	6¾— 7¼	..	..	..	4 16 7
160,000‡	Do. do. 3½ % Deb. Stock Red.	100	3½%	3 %	3½%	3½%	83 — 88 xd	83 — 88	87	86	..	3 19 7
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	4 %	Nil	Nil	1/32 — 3/32	1/32 — 3/32	..	..	..	Nil
50,000	Do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	70 — 74	70 — 74	..	..	..	5 8 1
65,000	South London Electricity Supply, Ord.	5	4 %	4 %	3 %	4 %	2⅝— 2¾	2⅝— 2¾	..	..	..	6 19 2
120,000	South Met. Elec. Lt. & Power, Ord.	1	Nil	2⅜%	2⅜%	2½%	7/32 — 9/32	7/32 — 9/32	..	..	..	3 6 8
117,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1 1/16 — 1 3/16	1 — 1⅛	..	..	— 1/16	5 12 0
200,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	1 — 2	1 — 2	..	..	..	12 10 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	1⅝— 2⅜	1⅝— 2⅜	..	..	..	10 10 6
200,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	87 — 90	87 — 90	..	..	..	5 0 0
110,000	Westminster Electric Supply, Ord.	5	14 %	13 %	12 %	10 %	7⅞— 8⅜	7⅞— 8⅛	8 1/16	8¼	..	5 14 3
81,279	Do. do. 4½ % Cum. Pref. (Original 5 %.—Red. to 4½ % from 31st Dec., 1905)	5	5 %	5 %	4½%	4½%	4⅛— 5⅛ xd	4⅛— 5⅛	5⅛	..	..	4 5 9

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. § Interim Dividend.

Bank rate of Discount 2½ per cent., May 28th, 1908.

PROCEEDINGS OF INSTITUTIONS.

Switchgear Control Apparatus and Relays for Alternating-Current Circuits.

By CHARLES C. GARRARD, Member.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS, *London, May 14th*, 1908.)

(*Concluded from page* 40.)

At the present time it is general practice to install time-element maximum circuit-breaking devices, in various positions, on all large systems. We will only consider inverse time-element circuit-breakers. Hitherto it has been considered generally that fuses possess an inverse time-element action. It must not be assumed that this is always the case; it is, however, often true. A

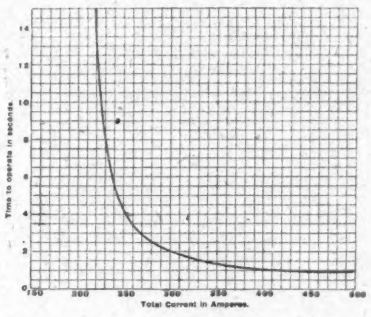
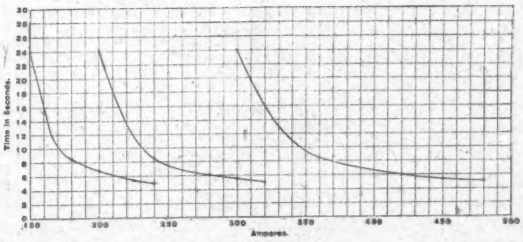


FIG. 6.—TIME ELEMENT OF H.T. FUSE.

105-ampere high-tension fuse, which has been used on the outgoing feeders in the 50-cycle generating station referred to later, consists of seven strands of No. 24 S.W.G. silver wire, each strand being enclosed in a small glass tube for a short distance in the middle, the whole being surrounded by an outer glass tube. The wires are spaced out by asbestos washers, and the outer tube is filled with French chalk, except for the small space in the middle where the wires are enclosed in the small glass tubes. The engineer has kindly informed me that these fuses have never blown due to shorts on the low-tension network. Whenever they have blown it has been due to a failure in the feeder, in that part of it between the generating station and the first sub-station. The time element of this fuse is



Standard 10-ampere relay 25 cycles. Set to operate at 60 per cent., 80 per cent. and 120 per cent. of full load, that is, 150 amperes, 200 amperes and 300 amperes in conjunction with a 20:1 ratio current transformer.

FIG. 7.

given in the curve in fig. 6. This curve was taken by keeping 80 amperes flowing through the fuse till normal temperature was reached, then suddenly increasing the current to the value given in the curve, and noting the time taken to blow.

Apart altogether from the difficulty of arranging two fuses in series with the certainty of one operating before the other, high-tension fuses cannot now compete with automatic circuit-breakers either in cost or efficiency.

If it has been decided that a time-element circuit-breaker is necessary on the outgoing feeder, the next point to determine is what this time element should be. If it were only a question of arranging the various switches so that they opened in a predetermined order the feeder time lag would be made as long as possible, as, naturally, the longer it is the more chance have the distant circuit-breakers of operating before the feeder. Fig. 7 shows the calibration of outgoing feeder relays installed on the 6,600-volt 25-cycle three-phase feeders in a large generating station in Scotland. The curves of fig. 7 were arranged so that, under all conditions, the machine breaker should operate before the feeder breaker had time to do so. These settings have proved to be satisfactory on the system in question. The sub-station machinery in this case consisted almost exclusively of induction motor-generators.

Relays having time elements, as in fig. 7, were subsequently installed on the outgoing feeders in a similar English 6,600-volt system, except that in this case the sub-station machinery consisted almost exclusively of 50-cycle synchronous motor-generators. The difficulty was at once experienced that with the comparatively long time elements, whenever a severe high-tension short came on the system,

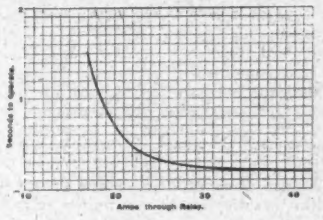


FIG. 8.—CALIBRATION CURVE OF OUTGOING FEEDER RELAYS FEEDING SUB-STATIONS CONTAINING 50-CYCLE SYNCHRONOUS MACHINERY.

the shock was so great that a great deal of the synchronous sub-station machinery fell out of step. Generally a swinging of the current to and from the sub-stations was set up, which increased until the motors fell out of step. To get over this the time elements were shortened several times until the calibration curve as given in fig. 8 was obtained on the outgoing feeders. It is considered that with such settings the system will be able to clear itself of high-tension short circuits without any danger of affecting the synchronous machinery other than that fed by the faulty feeder.

The time element of an instantaneous release is less than $\frac{1}{15}$th of the time element shown in the curve No. 8. The general conclusion to be drawn from these notes is that the necessary and desirable time elements of the circuit-breakers on each system must be determined experimentally. When installing maximum relays, therefore, they should be such that their time elements may be varied within wide limits independently of the currents at which they operate. It is not desirable to have the time element too easily adjustable by means of a screw or some such arrangement outside the relay, as this provides grave danger of the time settings being altered by unauthorised persons. The time elements of all the circuit-breakers on the system must be considered as a whole, and after the correct values have been found the settings need never be altered.

DISCUSSION.

MR. H. W. CLOTHIER, who opened the discussion, said he thought the worst offender in the matter of failure was the reverse current relay, it was so uncertain in action. In the Northumberland and Durham power circuits these relays had been removed, owing to the trouble experienced. He considered that time-element relays were almost as undesirable, as they allowed of surges affecting the running machinery. The necessary features of any such gear were that it should act instantly on a fault occurring; must be simple and applicable to all kinds of networks, and must be able to discriminate between good and faulty feeders. He considered that the Merz-Price system was the only one complying with these conditions, and it enabled a considerable saving in cable to be made when employed with sub-stations looped on to the generating station.

MR. B. WELBOURN, referring to the Merz-Price system, said that it was the practice in Durham to lay separate pilots for all cables; at present some 70 H.T. feeders (about 200 miles), supplying 60,000 KW. of plant, were at work. The gear had operated about 20 times, and there had never been a single failure. Mr. Merz had found it almost impossible to make relays discriminate on complicated networks; with the latter, as at Newcastle, it was absolutely necessary to use a balanced gear. He agreed with the previous speaker, that the time element in the interlocked reverse relay system proposed by the author would lead to trouble with synchronous plant.

MR. J. G. STATTER agreed with the author that the solenoid relay was more or less useless for the reasons stated. It was necessary to arrange the time lags on circuit-breakers, which were to be used in series and to act in a definite order, so that a small time element remained even on short-circuits occurring. He thought the wattmeter movement described by the author was not desirable in cases where a large reduction in current occurred. The solenoid movement had distinct uses for protecting motors.

MR. A. E. WEDMORE said the polyphase relay had some good features. A fault on three phases was a serious matter generally, and required prompt action, while a fault on only one phase might not require prompt action. He found that the test results given by the author for the solenoid bellows-type relay were practically correct. As regarded the fuse-shunted trip coil, he considered it advantageous that small current changes largely affected the time limit. After experimenting, one fuse material had been found to cover all requirements. The great argument against cross-connected transformers was their complication, and he had advocated the use of two or three relays, &c., where expense was not a consideration.

MR. LEONARD ANDREWS said he agreed generally with the author's remarks, but disagreed with him on the subject of failure of the field current. The author considered that if two machines

continued to run in synchronism, the faulty machine need not be disconnected. He, the speaker, considered that the leading current on one machine would enter the other, where it would be a lagging current; the direct-current field would vanish owing to the reactance and the volts would drop near zero, causing any synchronous machinery to fall out of step. He thought the Merz-Price system fulfilled what reverse relays would never achieve, *i.e.*, adequately protected ring mains. He did not agree that that system was applicable to the majority of mains networks, which had no pilot wires, and the usual arrangements did very well.

Mr. K. Edgcumbe considered that the important thing was for the time lag to be independent of the "breaking" load; it was also important that reverse relays should be reverse current and not reverse power relays, as it was the current which caused the damage.

Mr. B. M. Jenkin drew attention to the fly-wheel effect of motor-generators, which practically made it necessary to treat sub-station plant as if it were generating plant at the power station. The energy which was fed back from the sub-station frequently operated both reverse relays and maximum cut-outs on motors and feeders.

Dr. Garrard, in reply, said the Merz-Price system, although excellent, was also complicated—much more so, in fact, than was originally intended. The difficulty was the pilot wire, which meant an extra duct and extra expense; the system afforded excellent protection to an interconnector, but there were many cases where maximum time-limit and reverse-current relays were better. It was not possible to get selective action with fuse-shunted trip coils; the use of different materials for fuses did not meet the difficulty. As regarded Mr. Jenkin's remarks, he was willing to set the sub-station relays at 100 per cent. or more, if desired.

AN EARTH INDICATOR FOR HIGH-PRESSURE THREE-PHASE PLANTS.

With the advent of power transmission by means of high-pressure three-phase currents, the tendency in switchboard design has been to employ switchgear of the remote control type, and to exclude all pressure-carrying conductors from the control board. An exception to this rule is, however, occasioned by the provision of earth indicating voltmeters in accordance with the regulations of the Board of Trade. These are usually static instruments, one being connected between each phase and earth, and, on account of the high

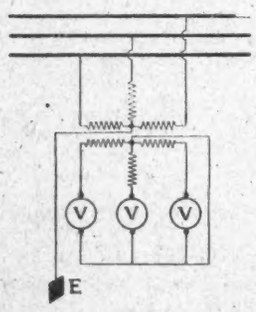


Fig. 1.

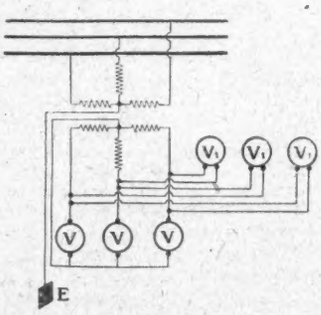


Fig. 2.

price of such instruments, their use is attended by a not inconsiderable increase in the total cost of the switchgear.

By the employment of the method described below, which has been introduced by the Felten & Guilleaume-Lahmeyerwerke A.-G., of Frankfort-on-Main, this drawback is removed, as in place of the expensive and sensitive static voltmeters, low voltage electromagnetic instruments are employed. The principle of the device is shown in fig. 1. To the three bus-bars of a H.T. three-phase installation to be tested a small pressure transformer is connected, the neutral point of whose primary is earthed. On the secondary side of the transformer three low-voltage voltmeters are connected between the extremities of the three phases and the neutral point. Should an earth now occur in one of the H.T. lines, a flow of current takes place through the earth from this point to the neutral point of the transformer primary, and the arm of the transformer corresponding to the line in which the fault lies will be deprived of its current. The reading of the voltmeter connected to the secondary of this phase will consequently be diminished, while the other two voltmeters will indicate a higher voltage than under normal conditions.

As shown in fig. 2 the bus-bar voltmeters may advantageously be connected to the earth-indicating transformer, or in other words, the earth-indicating voltmeters may be connected to the bus-bar pressure transformer, which is present in most H.T. installations to reduce the pressure on the switchboard voltmeters and recording instruments. The only addition required is an earth connection from the neutral point of the transformer. If an earth should occur in any one of the H.T. lines, the phase voltmeters are not affected, while the earth-indicating voltmeters will show by the difference in their readings in which phase the fault lies.

A simplification of the whole installation may be attained as shown in fig. 3, by the provision of only 1 voltmeter to indicate the bus-bar pressure, and one for the earth indicator, the latter being fitted with a three-way switch. One terminal of the voltmeter v may then be connected to the neutral of the transformer secondary, and the other to the extremity of each of the phases in turn.

Finally, it is unnecessary to provide a separate voltmeter for the earth indicator, as the same voltmeter may be employed to measure both the bus-bar voltage between phases and the voltage to earth

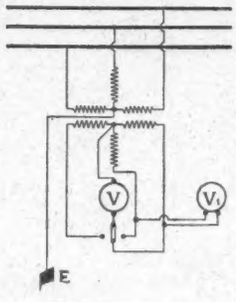


Fig. 3.

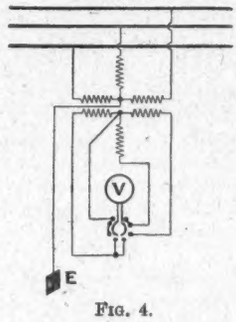


Fig. 4.

of each of the phases, by means of a suitable switch (fig. 4). On account of its cheapness, and the small space required for the various instruments, this connection is of particular value for small installations, as a small double-pole four-way switch is the only apparatus required in addition to the voltmeter with its transformer, which must in any case be provided to measure the pressure of the system.

THE PROFITS OF MUNICIPAL ENTERPRISE.

[From a Legal Contributor.]

Certain questions of considerable interest to those who have to do with municipal trading have recently been discussed by the Manchester City Council. It appears that they are making so much money out of their various enterprises that they do not know what to do with it. The question is—Should the profits of the municipal trading departments be applied in relief of the rates, and so be enjoyed by the whole body of ratepayers? Or should they be distributed amongst the customers of the several departments in the form of cheaper gas, lower tramway fares, or other concessions by which the profits now earned might be reduced or wiped out? The present policy of the Manchester City Fathers is to apply the profits in relief of the rates generally; but to this there are certain objections. Thus, it is pointed out that it is unfair to make the gas consumer contribute to relieve the rates of his fellow citizen who uses electric light and is usually better off. No doubt, however, most of the ratepayers use gas, and there is probably some rough correspondence between what one loses as a gas consumer and gains as a ratepayer; but it is manifest that the problem presents many difficulties, from whatever point of view it is approached. We wonder whether the possibility of a municipal body making too much money ever occurred to the legislative mind when the necessary statutory powers were conferred. Having regard to the extraordinary measure of success which has attended this kind of enterprise in some parts of the country, it seems to us that these bodies are allowed to carry out their undertakings on terms which are really too easy. The first thing which occurs to the mind is the Public Authorities' Protection Act. Does a corporation which is competent to run a business at a huge profit require a greater meed of protection than an ordinary trading company? Cases have occurred in which unfortunate persons have been debarred their remedy owing to a municipal corporation being in an unduly favoured position. The chief provisions of the Public Authorities' Protection Act are that an action must be brought within six months, and that if another opportunity of tendering amends is not granted, the plaintiff may have to pay increased costs. It appears

to us that any corporation which is so well able to look after the interests of the public that it does not know what to do with the profits of the enterprise ought to be placed on a level with any other trading corporation.

ELECTRICITY OR GAS?—THE PROBLEM OF THE SMALL CONSUMER.

By JOHN D. MACKENZIE.

(*Concluded from Vol.* 62, *page* 1017.)

The Auto-Transformer.—The auto-transformer is so well-known as scarcely to require any description. As it is quite possible, however, to connect up such transformers incorrectly, and especially as a case of that kind has been mentioned to

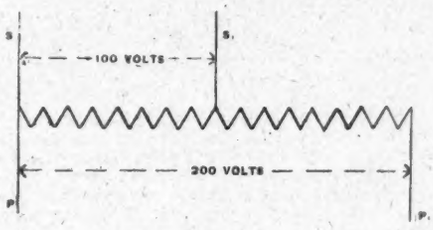


Fig. 3.

the writer since the first portion of this article was printed, it may not be out of place to say a few words on the subject. The auto-transformer is essentially a transformer in which a portion of the primary winding acts as a secondary winding, if the voltage is to be stepped down. If the voltage is to

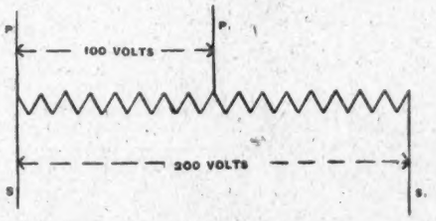


Fig. 4.

be raised, however, the primary winding is then a portion of the secondary winding. The accompanying sketches will illustrate what is meant.

In figs. 3 and 4, P, P_1 represent the primary terminals, and S, S_1, the secondary. It will be noticed in fig. 3 that the primary voltage is 200, and at the centre point of the

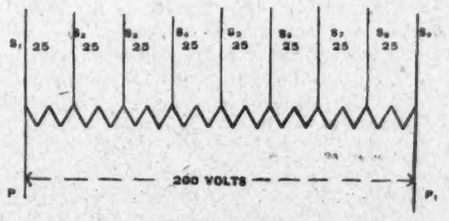


Fig. 5.

winding the tapping S_1 is taken off to give the secondary voltage of 100 volts. In fig. 4, however, the auto-transformer connections have been reversed, and the primary voltage of 100 now gives a secondary voltage of 200 volts. This is what is known as a "booster" transformer. From this it is quite evident that a misconnection may result in an increased voltage instead of a decrease. The normal connections for an eight-circuit 200-volt to 25-volt auto-transformer are shown in fig. 5. From this it may be noticed that nine terminals suffice for the connection of the primary and the eight secondary circuits. It is very important to have the primary connections clearly marked owing to the "boosting" property of the auto-transformer referred to above. In fig. 6 an arrangement of the terminals is shown; P S_1 and P_1 S_9 are the primary connections. Suppose, however, that, by mistake, the primary is con-

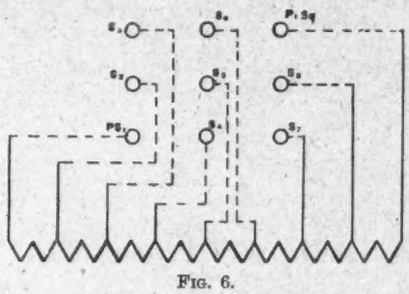


Fig. 6.

nected to P S_1 and S_7: the result would be to boost the 200 volts up to 250 volts, and instead of obtaining 25 volts in each circuit, the voltage would exceed 31.

This sort of thing has actually happened, resulting in a considerable breakage of metallic-filament lamps, and hence it is necessary to call special attention to it.

Fig. 5 shows a 200-volt circuit divided up into eight circuits of 25 volts each. Should the voltage, however, be, say, 220, it is obvious that the manner of obtaining the

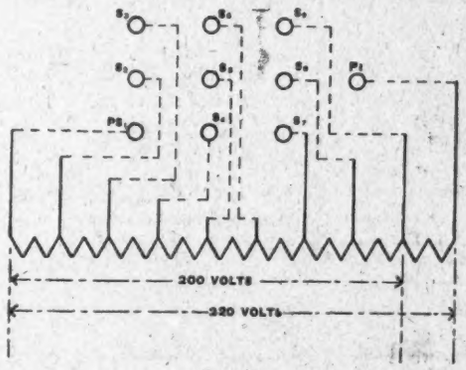


Fig. 7.

required secondary voltage is as indicated in fig. 7; in this case an extra terminal P_1 is necessary.

This latter arrangement, of course, is not balanced. As the portion of the winding between S_9 and P_1 must carry the total current, it is evident that the lamp capacity of such an auto-transformer must necessarily be limited by the current-carrying capacity of this winding.

With a balanced auto-transformer, however, the capacity is only limited by the maximum out-of-balance current which is likely to be in the circuit. For the case under consideration this may be assumed at a maximum of three lamps taking a total current of, say, approximately 2 amperes. The winding of the unbalanced transformer indicated in fig. 7 would require to carry the total current for the maximum lamps installed on any one circuit, namely, five lamps, equivalent to a current of 3·5 amperes.

Wiring Details.—Everyone, no doubt, is more or less familiar with the general arrangement of a flexible-wire system, but as it is very possible that the details of the system, and the accessories used, are unknown to many readers, it may be advisable to describe some typical forms. There are, of course, many different types, each manufacturer having his own specialities, but those described here are such as lead to very good results.

The wiring of a switch and lighting point is illustrated in fig. 8; fig. 9 shows the arrangement of the switch and distributing joint box. These illustrations are from untouched photographs of an ordinary installation wired without any attempt at special refinements, and they show how inconspicuous such a system may be.

Insulators.—The simplest insulator in use is a plain bobbin, as shown at A, fig. 10. These are made in several sizes, but a useful size is one having an overall height of 20 mm. (about $\frac{3}{4}$ in.). These insulators are fixed to walls and ceilings, and the flexible wire is opened out and slipped over the insulator—as shown at B (fig. 10)—where it is retained in the groove. One advantage of such a simple

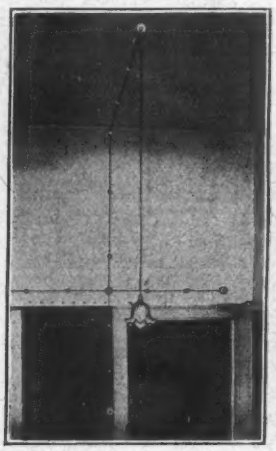


FIG. 8.

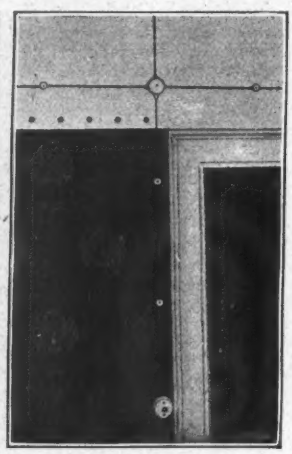


FIG. 9.

arrangement as this is that the wire may be easily slipped off the insulator in order to clean walls and ceilings. Several other types will be found illustrated in Prof. Schwartz's paper on "Flexibles" already referred to (see ELECTRICAL REVIEW, page 1016, June 19th). The insulator used in the installation shown in figs. 8 and 9 is illustrated at C, fig. 10, and consists of two parts, the plunger *a* and the collar *b*. The length of *a* is so arranged with reference to the thickness of *b*, that when inserted in *b* it is impossible in screwing it up to injure the flexible wire, which is at the same time securely held between the shoulder of *a* and the face of the collar. This insulator is easily obtainable in this country.

The method of fixing the insulators on wood or on lath and plaster walls, ceilings, &c., is simply by means of ordinary wood screws. On brickwork, however, the simplest method is to use small hardened steel dowels, having a

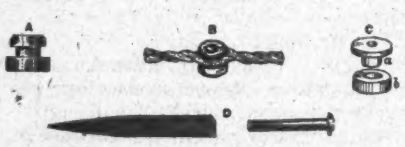


FIG. 10.

FIG. 11.—ELEVATION AND BACK VIEW.

tapped hole in which a brass screw can be inserted. Such a dowel is shown at D, fig. 10. These dowels are simply driven straight into the wall where required, and are quite capable of entering an ordinary brick and obtaining a good hold in it. In passing, the writer may say he is surprised that more use is not made of these steel dowels for fixing saddles in conduit work, as they show an immense saving of time and labour compared with the usual method of plugging walls and inserting wooden plugs.

Distributing Boxes.—These are simple porcelain bases fitted with terminal screws and provided either with porcelain or moulded fibre covers. There are various methods of arranging the terminals so as to enable the necessary connections to be readily made. Several forms are illustrated in fig. 12. The simplest arrangement is a four-way distributing box shown at A. There are four sets of terminals connected together in pairs; the main terminals are slotted so that the flexible leads may be bared, passed into the terminals and clamped up without cutting through the wires. This box is provided with a porcelain cover fixed by a screw passing through the centre.

B shows a double-pole two-terminal porcelain for use where wires come through a wall. There is a hole through the centre of the porcelain base into which the end of the porcelain or fibre tube passing through the wall is entered. The wires coming through to feed the box are connected to the terminals shown, and may then be tapped off in four directions if desired. A fibre cap B_1 fits closely over the box and protects the live connections.

For taking off switch and lighting connections a three-terminal box is required such as is shown at C. The connections are made as shown in diagram C_1. The porcelain cover for this box is also shown in the illustration.

A form of box which is readily convertible into a cheap form of ceiling rose is shown at D, and in use as a ceiling rose at D_1. It must, however, be used with flexible wire having a suspending cord (*Traglitze*) to prevent the weight of the fitting from coming on the conductors or terminals. The arrangement is clearly shown in the figure.

Ceiling Roses.—Besides the form just described there are, of course, various other patterns similar to those in use with us, but the bases are grooved out to allow the conductors to pass in. Provision is also often made for double-pole clip fuses arranged on thin fibre bridges with metal end connections.

Switches.—Any ordinary type of switch may be used so long as provision is made to permit the wires to enter behind the base without damage. Owing, however, to the low voltage suggested, a much less expensive article acts quite satisfactorily.

The usual "turn" type of Continental switch is well known and needs no description, but there is a small cheap type illustrated in fig. 11, which is, perhaps, not so common here. The porcelain base is in one piece, and the switch contacts and mechanism are sunk in a recess at the back, as seen in the view showing the back of the switch. A fibre disk is placed behind the switch, so as to prevent any accidental contact between the live metal and the wall. This is the switch shown in the illustrations figs. 8 and 9.

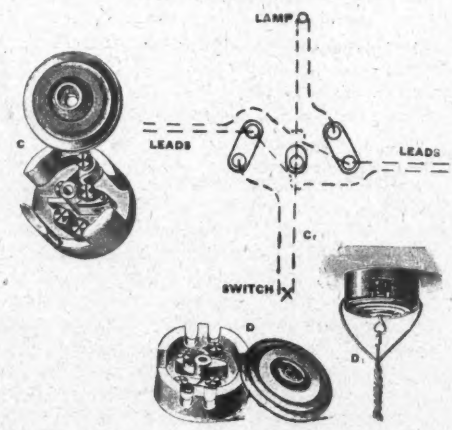


FIG. 12.

Such, in brief, are the main features of the flexible wiring systems in use on the Continent, and which seem to give satisfaction there. Now what, in conclusion, are the objections urged against the adoption of such a method in this country? We are told that it is unsafe on high voltages, and that has been taken for granted in this article. Surely no one will say it is unsafe at 25 volts.

We are told again that it is not permanent enough to satisfy our insular conceptions. Permanency, however, is after all only a relative term, and such a system seems permanent enough for the class of work suggested. Besides,

the cheapness of erection and of repairs in such a system as this counterbalance any objection raised as to want of permanency.

Fire risks will probably be urged as another objection, and it is significant to learn that the fire risk on flexible wiring systems in Germany is considered less than on wood-casing systems.

Against all these and other objections the writer would urge the undoubted need of a cheaper system than at present is permitted in this country, and he thinks that a system which is so extensively used abroad ought to be given a fair trial here. The small consumers are a very large class; they have a better lamp-hour average per lamp installed than the larger consumers, and the time is ripe for the central-station engineer to bring them into the number of his clients. Consequently the writer hopes that these remarks may lead to a discussion of ways and means that may result finally in achieving this object.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Are Consulting Engineers Necessary?

In your issue of June 19th, "A Manufacturer," who unfortunately remains nameless, puts forward his experience and views on this important question, which is now being ventilated in your contemporary, the *Electrician*. He refers to the class of consulting engineer who has no right to the name of such, and whose elimination from the profession is aimed at in the present movement. However, these are the black sheep which are to be found in every open profession, and although their numbers have increased lately, it should not be difficult to obtain the desired result, if only the manufacturers and the profession would put their heads and hands together. There are also some resident engineers who obtain their measure of knowledge from consulting engineers' specifications, but far more do so from manufacturers' tenders and correspondence. Unfortunately, there are also consulting engineers who do this, but their number is not large, and they belong to the class above mentioned.

This matter can also very easily be dealt with by the manufacturers' organisations, by refusing to tender unless on a clear specification drawn up by a reputed consultant or resident engineer. If the manufacturer does the consultant's work, he should certainly be paid for it, and generally is, as his whole organisation connected with the estimating and selling department is being paid for out of the general charges, which are again reflected in the prices asked. But the manufacturer is not able or qualified to do this work, and therefore he should refuse to perform it. His complete staff, including all the engineering talent in his employ would probably be qualified to give advice on general schemes, methods, and arrangements of plants, but in most cases only an infinitesimal part of this engineering talent, in the person of one of the engineers in the estimating department or drawing office, is brought to bear on each job. (I am speaking from ample personal experience with several of the largest manufacturing firms at home and abroad.) But it is not the manufacturer's business at all. His business is to *manufacture*, not to study and advise on complicated schemes. His drawing office time is better spent on devising new and improved plant, and cheaper and better methods of construction, just the same as a firm of builders should not design statues, &c. That both contractors and consultants should seek to hide possible errors is, of course, human, but this applies to both classes, and the attempts need not succeed if both parties know their own businesses.

I daresay "Manufacturer" is able to estimate for horse-power required, but it is not his work, and leads to the various firms sending in tenders based on different estimates which only bewilder their clients.

I fully agree with the last clause in "Manufacturer's" letter, and it is to reach this end that efforts are being made at present.

With the letter signed "Verbum Sap." in your last issue I am completely in agreement. The code of etiquette drawn up by the Institute is a wholly one-sided measure, and is not even enforced or obeyed by anyone. It is a farce as long as the consultant's practice is left unprotected, in addition to being hampered. Clauses Sub. 1, 2 and 3 should be left to the taste of the individual, and 4, 5 and 6 should be strictly enforced.

In addition to less business due to municipal and resident engineers' and also manufacturers' breakneck methods to secure work, the most glaring fault of the present system is that salaried engineers and insurance companies act as consultants. The latter practice, which especially flourishes in the North, may surely be hall-marked as unfair competition. In brief, the present movement should result in (*a*) a conference between the various institutions as to etiquette in respect to the work belonging to each profession; (*b*) the immediate formation of an Institute of Consulting Electrical Engineers to act as a "roll" in conjunction with the Manufacturers' Association, and to this end, I, for one, shall be glad to co-operate.

Gerald J. Hooghwinkel.

Westminster, *July 4th*, 1908.

Working Speed in Telegraphy.

Mr. Charles Bright's quotation of my words falls short of giving the sense of what I wrote about long-distance wireless duplex. A full stop and no context replace my comma and what follows.

Mr. Bright's former statement that duplex-automatic is "for long distances only applicable to wire telegraphy at present" led me to point to a known instance of practical long-distance radio-duplex, by the Poulsen system, across 1,250 miles. Surely this is genuine long-distance work, especially when considered in the light of Mr. Marconi's words, as reported in the *Morning Post* of May 20th, relating to his satisfactory duplex results up to four or five miles.

Regarding Mr. Bright's fresh inquiry as to "the distances at which the duplex-automatic system is in successful practical operation with wireless telegraphy," this is really outside the three points raised by me in the annotations with which I ventured to supplement Mr. Bright's friendly animadversion on certain conclusions of my own. My three points were:—

1. Effect of daily Press statements on shareholders.
2. Applicability of auto-transmission to long-distance radio work.
3. Applicability of duplex to like conditions.

In the case of (1) I had, in New York, ocular and auricular proof that daily newspaper over-statements of wireless results keenly influenced the general public.

As for (2) and (3) this correspondence has shown that both auto and duplex *are applicable* to long-distance radio-telegraphy.

But to reply to Mr. Bright's aforementioned query about "the duplex-automatic system":—The word automatic, as involving no difficulty, and so meaning nothing, may straightway be excised. Technically, duplex-automatic cannot be more difficult than duplex with hand sending. There is no such special virtue in the hyphenated expression "duplex-automatic" as the old dame thought there was in "that blessed word Mesopotamia." The only point is in the word duplex.

Apart from the already quoted striking instance of successful long-distance radio-duplex between Lyngby and the ss. *Hellig Olav*, across 1,250 miles of land and sea, I am in a position to affirm, on the word of a very high technical authority in close touch with the actual work, that, with the Poulsen apparatus, long-distance duplex is a certainty, not only on the evidence of the aforementioned 1,250-mile instance (which is quite authentic), but on other grounds which I am not, at present, free to particularise.

With any radio system possessed of the same technical attributes as those inherent in the Poulsen, duplex is feasible where simplex is feasible.

When the long-distance radio systems have settled down to work under the new Convention rules, and have got their

installations—now in course of erection, or of alteration—into order, and have tuned down or up within the lower or the upper margins of wave-length possibilities left to them by an exacting Admiralty who have—doubtless rightly—appropriated the lion's share and largest slice out of the cake . . . . when all this has come to pass, the additional statistics pertinently and rightly sought by Mr. Bright will certainly be forthcoming.

Yes, as Mr. Bright tells us, radio-diplex is easy (witness the De Forest and Poulsen systems working, at Cullercoats, in parallel from the same antenna), but diplex is not easier than undamped-wave duplex.

Yet, taking all this into account, cable working, with its present very high standard of efficiency daily developing fresh possibilities . . . . fresh actualities in speed attributes, remains paramount, and practically untouched.

E. Raymond-Barker.

Wimbledon, *July 5th*, 1908.

Telephone Licences.

With reference to the letter which appeared in your last week's issue, in which the writer makes certain comments on a communication from me which you were good enough to insert in yours of the 19th ult., it is, of course, the case, as anyone with even a modicum of knowledge of matters telephonic is aware, that an "A to A," *i.e.*, a private line, is entirely outside the scope of the Postmaster-General's monopoly, but it unfortunately happens that a considerable difference of opinion has existed, if it does not still, as to what really does constitute a "private line." As a matter of fact, the Postmaster-General was not approached with a view to obtaining his sanction for the running of a line which did not in any way come under his jurisdiction, but for permission to run the necessary circuit along certain poles on the property of a railway company, over which he had exclusive wayleave rights. The gist of the response was that as, in the opinion of the Postmaster-General, the communication desired (notwithstanding the fact that it was to connect the houses of two doctors—partners) came within the scope of his monopoly, he was unable to assent.

I quite agree with the view held by your correspondent, that "A to B," as they are generally understood, are on a par with private lines, that is to say, they do not in any way infringe the Postmaster-General's monopoly.

Electrical Installations, Ltd.

H. Bell, *Secretary and Director.*

London, E.C., *July 6th*, 1908.

Public Tenders.

A large number of corporations, urban district councils, and other public bodies, in issuing tender forms for the supply of their annual requirements of various stores, in many cases specify the brands of certain manufacturers, thereby preventing open competition, and making tendering farcical.

In view of the disclosures made at the recent investigations by the Local Government Board, and the proceedings taken against certain Poor-Law Guardians and others, it seems to us it would be to the interest of the public bodies and the ratepayers they represent if all reference to specific brands were eliminated from such tender forms, so as to leave the same open to fair and unrestricted competition.

The Stern Sonneborn Oil Co., Ltd.

Julius Wallach,
Managing Director.

London, E.C., *July 2nd*, 1908.

Placing Orders Abroad.

Your correspondent "T." seems to me to be wasting a lot of time in discussing irrelevant matter. It is evident that he can, if he will, answer my questions, and if he will do so I for one will be much obliged. The answers to the questions I ask are really matters of fact and have no intrinsic connection with party politics whatever.

I feel sure that "T." will agree with me when I say that the correct answers to the questions referred to are of vital importance to the discussion. I can assure him that in any letter I may have to write in connection with this question, party politics will have no place.

Geo. W. Green.

London, S.E., *July 1st*, 1908.

ROYAL SOCIETY CONVERSAZIONE.

The second Royal Society *soirée* was held at Burlington House on June 29th, and, as usual, there were a number of interesting exhibits for the entertainment of the guests. A number of these had been shown at the previous *soirée* on May 13th, and we shall describe here only those that we have not already noticed.

Dr. J. A. Fleming, F.R.S., exhibited arrangements showing a form of inductive wireless telegraphy. Prior to the date of Marconi's inventions, many inventors, such as Sir William Preece and Sir Oliver Lodge, had put in practice to a limited extent a method of communication based on the inductive effect of one electric current on another. In this method one electric circuit was traversed by a low-frequency alternating current, interrupted at intervals in accordance with the signals of the Morse alphabet. At another point, at a distance, a similar circuit was arranged, having a telephone in series with it. The currents in the transmitting circuit induce much feebler currents in the receiving circuit, which last produce sounds in the telephone.

Dr. Fleming's improvements consist in employing in the transmitting circuit a high-frequency oscillation, set up by the discharge of a Leyden jar; the discharge takes place across a spark gap enclosed in a silencing chamber, the spark being acted upon by an air jet provided by a small electric motor blower. The signals are made by interrupting the primary circuit of the induction coil by means of a key operated in turn by a punched tape, as in the Wheatstone automatic system. By this means, long or short trains of high-frequency oscillations are set up in a closed electric circuit consisting of a few turns of wire, wound on a frame.

This transmitting circuit was set up at one end of the main library of the Royal Society, and at the most distant end of the suite of rooms, 100 ft. away, a similar circuit of a few feet of wire was set up, the transmitting and receiving circuits being tuned to one another. In this case the extremely feeble high-frequency currents set up by the induction of the transmitting circuit are totally incapable of affecting a telephone directly, but Dr. Fleming places in the secondary circuit a device called an oscillation valve which consists of a small metallic-filament glow lamp having a copper cylinder sealed in the bulb and surrounding the filament. The filament is rendered incandescent by a small battery, across the terminals of which is a high resistant shunt, and some point on this wire is connected through a telephone with one terminal of the condenser or Leyden jar in the receiving circuit. The other terminal of the condenser is connected to the copper cylinder in the glow-lamp bulb. From the filament of the glow lamp negative electricity is continually being given off, and the action of the extremely feeble electric oscillations taking place in the receiving circuit is to increase this escape of negative electricity, which, passing through the telephone, makes itself evident by the creation of a feeble sound. Hence, on listening to the telephone, the observer hears long or short sounds corresponding to the long or short closures of the primary circuit of the induction coil at the transmitting end. In this way signals in the Morse alphabet are sent.

At the *soirée*, messages were continually sent from one end of the Society's rooms to the other, a distance of 100 ft., by the inductive action of two small square circuits, which could not have been done by the simple employment of low-frequency alternating currents.

Mr. J. E. Barnard exhibited mercury-vapour lamps

applied to microscope illumination. Mercury-vapour lamps have considerable advantages as illuminants for microscopic work, as their visible spectrum consists chiefly of three bright lines—one each in the orange, green and blue-violet. It is, therefore, possible by using suitable absorbent colour screens to transmit only one bright line of the required colour, the remaining ones being absorbed. The source of light then becomes truly monochromatic, and is practically of one wave length. Even without colour screens there is a marked increase of resolving power, owing to the absence of red radiations and the consequent reduction in mean wave length compared with those illuminants in which such red radiations occur.

An ingenious application of Röntgen ray photography was exhibited by Dr. G. H. Rodman, in the form of a series of beautiful stereoscopic views of molluscal shells. Prior to the application of the Röntgen rays to this branch of zoological research, it was necessary to sacrifice the specimen in order to disclose the internal anatomy of the columella and whorls—a course obviously undesirable in the case of a rare and possibly unique shell.

Dr. Alexander Muirhead, F.R.S., exhibited a combined Kelvin siphon recorder and cable relay. The latest form of the Kelvin siphon recorder has been converted into a successful cable relay by simply substituting fine gold wire for the silk fibre which connects the siphon to the vibrator. The local contacts are made between the vibrating gold wire and two silver stops which are connected to the two terminals of the local or retransmitting line battery. The combined recorder and cable relay was shown in operation between two circuits of Muirhead artificial cable, each having a K.R. of 3 seconds.

RESTRICTIVE COVENANTS.

[FROM A LEGAL CONTRIBUTOR.]

A CORRESPONDENT has recently drawn our attention to an agreement which raises most interesting questions in relation to what are known as restrictive covenants. It appears that a certain firm of engineers in the Midlands contract with a man for, say, three years, during which time he must devote himself solely to the business of the company, and must not be in any way connected with any other company, and before leaving must give three months' notice; they, on their part, reserve the right to dismiss him at a moment's notice if, in the opinion of the managing director, he is not competent, which means that should they for any reason require to replace him it is a very simple matter to do so. Then the man must not enter into the employment of a competitive firm for a period of three years after the agreement has expired. All this might be tolerated if there were compensating advantages in the matter of salary, but this is apparently out of the question.

Our correspondent points out that a number of cases have come to his notice where the employés have been dismissed because they would not sign this agreement, and he is of opinion that they were quite justified in their action. He adds that "any respectable firm would have no hesitation in engaging them if they knew the circumstances, I feel sure, although their employers might refuse them a reference."

It is by no means easy to say straight off whether this agreement would be binding upon the employé. It is first necessary to consider certain principles of law which apply to all contracts of the kind. Any contract which, like that above considered, prevents a man from entering into other employment after the determination of his present contract, is in restraint of trade, and is therefore void—subject to the following considerations. If the restrictive covenant is not so wide as to press hardly upon the employé, and not such as to be injurious to the public, it will be upheld. The question whether the contract is reasonable or not, is a matter of time and space. If a covenant prevented a man from entering into the service of any engineering firm at any time, it would be void as being in restraint of trade. On the other hand, suppose a man were employed in Manchester, and a covenant prevented his taking employment with any competing firm in that town for a period of one year after the end of service. That would probably be upheld as reasonably necessary for the protection of master and man.

The question whether a covenant is or is not too wide, is for the Court to decide. Regard is had to the nature of the interests which require protection. Thus it has been held that it was unreasonable to seek to prevent a dentist carrying on his practice within 200 miles of York, it being considered that the limit of 200 miles was too wide. Where, however, a particular trade or industry is world-wide in its character, a world-wide covenant may be held reasonable. Thus a man was prevented from manufacturing certain explosives in any part of the world under a covenant of this kind.

In a case of Walker *v.* Webley, which was tried in 1904, the plaintiffs, a firm carrying on business as grocers and general provision merchants, sought to restrain the defendant, who had been a manager of a branch of their business, from carrying on any business similar to theirs in breach of an agreement made on July 9th, 1894. Clause 9 of this agreement provided that the defendant should not, at any time thereafter, without the permission in writing of the plaintiffs, be engaged "in any business whatever," either on his own account or as manager or assistant for any other person, firm, or company, within a distance of 7 miles from any shop in which the defendant should have acted as manager for the plaintiffs. It appeared that the defendant, having left the employment of the plaintiffs, had entered into partnership with another grocer and general storekeeper carrying on business within the stipulated limit. It was argued on the part of the defendant that inasmuch as this covenant was wider than was reasonably necessary for the plaintiffs' protection, it should be held void *in toto*. In spite of this argument, it was decided that upon the true construction of the agreement the general words "any business whatever" must mean any business of a similar kind to that carried on by the plaintiffs, unless there were further words in the agreement which would compel a wider interpretation (as in Perls *v.* Saalfield 66 L.T. Rep. 666), that in this case there were no such controlling words, and that consequently no greater restraint was imposed than was necessary for the protection of the plaintiffs. The Court, therefore, being of opinion that the agreement was valid, granted the injunction.

In another case (Rogers *v.* Maddocks, 1892, 3 ch. 346) the plaintiff engaged the defendant as a traveller to procure orders for, and to sell, malt liquors, and also, if required, to sell aerated waters to wholesale purchasing agents in a certain district. The defendant agreed that he would not be concerned in selling malt liquors or aerated waters for two years after the termination of his employment. The plaintiff never dealt in aerated waters. After leaving the plaintiff's employment the defendant became traveller to rival brewers within the same district, and in a subsequent action an injunction was granted to restrain him from continuing to act for the brewers, but no order was made as to the aerated waters, as the enforcement of that part of the covenant could not in any way benefit the plaintiff.

Applying the principles laid down in the above cases, it would seem that the clause by which "the man must not enter into the employment of a competitive firm for a period of three years after the agreement has expired," is too wide, and would not be enforced. Who is to decide what is a competitive firm? Suppose the employé were to act for a firm in Japan, would that be acting for a competitive firm? It has been decided in several cases that although the Court will sometimes divide up a covenant, enforce one part and refuse to enforce another, they will not give effect to any part which is too wide. It would be very interesting to hear a legal discussion upon the covenant contained in the agreement referred to by our correspondent.

The Summer Almanac.—We have received from MESSRS. W. T. GLOVER & CO., LTD., their seventh almanac for the ensuing twelve months, in the same style as before (detachable leaves). The useful information culled from technical publications for the benefit of the busy engineer is interspersed with humorous extracts from the same sources, which will do him at least as much good, by making him laugh.

NEW PATENTS APPLIED FOR, 1908.

Compiled expressly for this journal by W. P. THOMPSON & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

13,215. "Improvements in electricity meters." G. HOOKHAM. June 22nd.

13,220. "Improvements in electric lampholders." W. FENNELL and W. P. PERRY. June 22nd.

13,243. "Improvements in frequency measuring apparatus of the resonance type." G. G. M. HARDINGHAM. (Hartmann & Braun Akt.-Ges., Germany.) June 22nd.

13,257. "Improvements relating to electric furnaces." H. HELBERGER. June 22nd. (Complete.)

13,269. "Improvements in thermostatic annunciators." W. H. I. WELCH. June 22nd.

13,275. "Improvements in and relating to arc lamps." BRITISH THOMSON-HOUSTON Co., LTD., and W. H. DALTON. June 22nd.

13,295. "Improvements in earth electrodes." J. T. SZEK. June 23rd.

13,299. "Safety trolley chain for electric tramcars." J. CURRAN and E. KELLY. June 23rd. (Complete.)

13,327. "Improved automatic electric switch." R. F. VENNER, R. C. GRIESBACH and P. K. MORRIS. June 23rd.

13,361. "Improvements in automatic electric apparatus suitable for advertising purposes." A. E. VOSS. June 23rd.

13,378. "Improvements in magneto-electric machines." H. STEPHENS. June 24th.

13,401. "Improvements in electric motor control." A. ECKSTEIN, A. C. HEAP and D. B. MELLIS. June 24th.

13,408. "Instrument for the use of students of magnetism in its connection with the deviation of the mariners' compass." E. G. ENRIGHT. June 24th.

13,449. "Process for manipulating and mounting filaments of electric incandescent lamps." P. G. TRIQUET. June 24th. (Complete.)

13,451. "Improvements in repulsion electric motors." SIEMENS SCHUCKERTWERKE G.m.b.H. (Date applied for under Sec. 91 of the Act, August 24th, 1907, being date of application in Germany.) June 24th. (Complete.)

13,489. "Improvements relating to metal armouring for electric conductors." F. KUHLO. June 25th. (Complete.)

13,502. "Improvements in electric furnaces." C. E. KNOWLES. June 25th.

13,504. "Improvements in dynamo-electric machines." THE LANCASHIRE DYNAMO AND MOTOR Co., LTD., and R. S. MCLEOD. June 25th.

13,515. "Improvements in electric fuse boxes and fuse holders therefor." R. GROSE and W. R. LAMBERT. (Application for Patent of Addition to No. 6,849/07.) June 25th. (Complete.)

13,518. "Improvements in instruments for detecting electric oscillations." J. A. FLEMING. June 25th.

13,520. "Improvements relating to the control of electric motors." M. HARTENHEIM. June 25th.

13,524. "Improvements in and relating to thermostatic regulators." THE CAMBRIDGE SCIENTIFIC INSTRUMENT Co., LTD. (Hohmann & Maurer Manufacturing Co., United States.) June 25th. (Complete.)

13,526. "Improvements in and relating to thermostatic regulators." THE CAMBRIDGE SCIENTIFIC INSTRUMENT Co., LTD. (Hohmann & Maurer Manufacturing Co., United States.) June 25th. (Complete.)

13,580. "Improvements in electric arc lamps." SIEMENS BROS. DYNAMO WORKS, LTD., and C. R. RIBER. June 27th. (Complete.)

13,587. "Improved method of obtaining variations in the size of the air-gap in electrical machines." B. R. MILLS. June 27th.

13,633. "Improved chronometer for telephone calls." E. MULLER. June 27th. (Complete.)

13,649. "Improvements in apparatus for controlling and operating the track and conductor points of electric and other railways and tramways." T. O'NEILL, B. LANGTON and W. BOTTOMLEY. June 27th.

13,654. "Improvements in suspension devices for electric cables." W. T. HENLEY'S TELEGRAPH WORKS Co., LTD., and W. F. BISHOP. June 27th.

13,661. "Improvements in fittings for incandescence electric lamps." A. G. BLOXAM. (Siemens Schuckertwerke G.m.b.H., Germany.) June 27th. (Complete.)

13,666. "Process for removing the electrolytic nickel or other metallic coating of metallic surfaces." A. LEVY. June 27th. (Complete.)

13,671. "Galvanic element of the Bunsen type." K. HEINTZ. June 27th.

13,678. "Iron conductors for alternating current." A. WOLFF. June 27th. (Complete.)

ELECTRIC APPARATUS FOR COMMUNICATING BETWEEN ONE PART OF A VESSEL AND ANOTHER, AND FOR ANALOGOUS PURPOSES. T. A. Sedgwick. 12,406. May 29th.

SELF-REGULATING ELECTRICAL MACHINES FOR ALTERNATING OR DIRECT CURRENT. A. Heyland. 12,578. May 20th. (Date applied for under International Convention, May 30th, 1906.)

BALL AND SOCKET JOINTS FOR GAS, ELECTRIC LIGHT AND OTHER LIKE FITTINGS. J. Tonry. 12,857. June 3rd.

DEVICES FOR EFFECTING ELECTRIC SYNCHRONOUS WORKING OF TWO APPARATUS. M. Hellmann. 12,969. June 4th.

SYSTEMS FOR ELECTRIC RAILWAYS. A. C. Eastwood. 13,089. June 5th.

MEANS FOR ELECTRICALLY DETECTING THE POSITION OF THE SWITCH TONGUES AND LOCKING BOLTS OF RAILWAY POINTS. T. E. Haywood and McKenzie and Holland, Ltd. 14,572. June 25th.

CONTACT ARRANGEMENT AND STAND FOR ELECTRIC INCANDESCENT LAMPS. N. Kessler and G. Jelich. 18,013a. (Date applied for under Rule 13.) August 8th.

TELEPHONIC AND LIKE CALLING APPARATUS. C. H. Ellison and C. M. Jacobs. 18,808. August 13th.

MEANS FOR SUPPORTING ELECTRIC LAMPS. K. Fusser. 19,073. August 24th.

ELECTRIC AUTOMATIC TIME SWITCH MECHANISM. V. W. Moore. 19,447. August 30th.

ELECTRIC ARC LAMPS. O. Gross. 19,734. September 4th.

TRANSMITTERS FOR WIRELESS TELEGRAPHY. G. Marconi and Marconi's Wireless Telegraph Co. 20,119. September 9th.

TELEGRAPHIC CODE APPLIANCES. W. C. Dotesio and G. H. Powell. 21,950, October 4th.

MEANS FOR RECTIFYING ALTERNATE CURRENTS. Siemens Bros. & Co. (Siemens and Halske Akt.-Ges.) 24,753. November 8th.

DYNAMO-ELECTRIC MACHINES OF THE HOMOPOLAR TYPE. J. Arenas y Garcia. 25,850. November 15th. (Date applied for under International Convention, August 2nd, 1907.)

RADIO-TELEPHONY. Amalgamated Radio-Telegraph Co. (G. Seibt.) 27,879. December 11th.

ELECTRICAL DRIVING GEAR MORE ESPECIALLY INTENDED FOR MOTOR ROAD VEHICLES. G. W. Johnson. (Felten & Guilleaume Lahmeyerwerke Akt.-Ges.) 28,516. December 21st.

COMPENSATED ALTERNATE-CURRENT SERIES MOTORS. Felten & Guilleaume Lahmeyerwerke Akt.-Ges. 12,987. June 4th. (Date applied for under International Convention, July 12th, 1906.)

VOLTAGE-REGULATED SYSTEM FOR THE ELECTRIC LIGHTING AND HEATING OF VEHICLES H. Grob. 13,129. June 6th. (Date applied for under International Convention, June 9th, 1906.)

ENCLOSED ELECTRIC ARC LAMPS. J. Brockie. 13,147. June 6th.

ELECTRODES FOR ELECTRIC ARC LAMPS. H. T. Harrison and H. Hirst. 13,190. June 6th.

FUSIBLE ELECTRIC CUT-OUTS. E. Schattner. 13,432. June 10th.

REGULATION OF DYNAMO-ELECTRIC MACHINERY. Hon. C. A. Parsons and A. H. Law. 13,712. June 3rd.

COIN-CONTROLLED TELEPHONES. R. B. Jentzsch. 13,821. June 14th.

ELECTRICALLY-OPERATED ELECTRIC SWITCHES. A. Eckstein, A. C. Heap and D. B. Mellis. 14,567. June 25th.

ELECTRIC CONTROLLER REGULATORS. R. Amberton and E. Schattner. 15,366. July 3rd.

METHODS OF PRODUCING REFRACTORY ELECTRIC CONDUCTORS, PARTICULARLY METALLIC FILAMENTS. British Thomson-Houston Co. (General Electric Co., United States.) 15,367. July 3rd.

COMBINED ELECTRIC CONNECTION PLUG AND SOCKET AND SWITCH. W. W. Buckton. 17,300. July 29th. (Post-dated January 24th, 1908.)

MONO-PHASE SHUNT ELECTRIC MACHINES. Felten & Guilleaume Lahmeyerwerke Akt.-Ges. 18,044. August 8th. (Date applied for under International Convention, August 11th, 1906.)

MEANS FOR SIGNALLING THE APPROACH OF TRAMCARS AT CROSS-ROADS WHERE OVERHEAD ELECTRIC WIRES ARE EMPLOYED. G. A. Bailey. 18,187. August 12th.

ELECTRIC OSCILLOGRAPHS. J. T. Irwin. 20,824. September 19th.

IGNITION SYSTEMS COMPRISING MULTIPLE INDUCTION COILS WITH SEPARATE TREMBLER OR TREMBLERS. S. J. Watson and G. H. Smith. 22,082. October 7th.

ELECTRIC METER FOR CONTINUOUS CURRENT PROVIDED WITH A PERMANENT MAGNET AND AN ARMATURE ARRANGED IN THE FIELD THEREOF. W. Meyerling. 26,084. November 26th. (Date applied for under International Convention, November 23rd, 1906.)

SPARK PLUGS FOR EXPLOSION ENGINES. J. C. Anderson. 26,973. December 6th. (Post-dated December 11th, 1907.)

STARTING MEANS FOR VAPOUR-ELECTRIC DEVICES. P. H. Thomas. 28,220. December 21st. (Date applied for under International Convention, December 24th, 1906.)

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. THOMPSON & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1907.

AUTOMATIC SAFETY DEVICE FOR OVERHEAD ELECTRIC LINES. F. F. Bourdil. 19,891. September 5th. (Date applied for under International Convention, September 7th, 1906.)

PORTABLE ELECTRIC VULCANISING APPARATUS. J. Hay, H. R. Couper and W. H. Lindsay. 19,907. September 6th.

ELECTRIC TRANSFORMERS. L. Maiche. 21,535. September 28th. (Date applied for under International Convention, December 6th, 1906.)

MEANS FOR CAUSING AN ELECTRIC CURRENT OF VARIABLE DIRECTION TO FLOW ALWAYS IN ONE DIRECTION ONLY. Felten & Guilleaume Lahmeyerwerke Akt.-Ges. 23,329. October 22nd. (Date applied for under International Convention, October 22nd, 1906.)

RELAYS. I. Kitsee. 23,386. October 23rd.

ELECTRIC METERS. V. Arcioni. 25,123. November 12th.

ELECTRICAL IGNITION DEVICES FOR INTERNAL-COMBUSTION ENGINES. V. Barreto. 25,444. November 16th.

ELECTRIC SWITCHES. A. Loebl and the British Ever-Ready Electrical Co. 25,880. November 21st.

ELECTRICAL SYSTEMS OR ARRANGEMENTS FOR DRIVING MACHINERY SUBJECT TO VARIABLE LOADS. Siemens Schuckertwerke Ges. 27,073. December 7th. (Date applied for under International Convention, December 8th, 1906.)

ELECTRIC MOTOR CONTROL SYSTEMS. British Thomson-Houston Co. (General Electric Co., United States.) 10,072. April 30th.

TROLLEY HEADS OF ELECTRIC TRAMCARS AND THE LIKE. C. W. Collins, W. J. Hayes and F. W. Watson. 10,293. May 3rd.

RECEIVERS FOR WIRELESS TELEGRAPHY. L. W. Austin. 12,353. May 28th. (Date applied for under International Convention, May 29th, 1906.)

1908.

SECTION INSULATING ARRANGEMENTS FOR CONDUCTORS USED IN THE OVERHEAD CONSTRUCTION OF ELECTRIC RAILWAYS OR TRAMWAYS. Siemens Bros. Dynamo Works, Ltd. (Siemens Schuckertwerke Ges.) 4,112. February 24th.

SINGLE-PHASE COMMUTATOR MOTORS. Maschinenfabrik Oerlikon. 4,432. February 27th. (Date applied for under International Convention, March 9th, 1907.) (Application for Patent of Addition to No. 28,286/04.)

MANUFACTURE OF COILS OF LARGE SECTION FOR ELECTRO-MAGNETIC APPARATUS. Siemens Bros & Co. (Siemens & Halske Akt.-Ges.) 4,464. February 7th.

ELECTRICALLY-CONTROLLED APPARATUS FOR SEEING AT A DISTANCE. J. Adamian. 7,419. April 1st.

METHOD OF TRANSMITTING GRAPHIC SIGNS, PHOTOGRAPHS AND THE LIKE BY MEANS OF ELECTRIC CURRENT. Polyphos Elektricitäts Ges. 3,701. February 18th. (Date applied for under International Convention, February 25th, 1907.)

ELECTRICAL RADIATORS. H. J. Dowsing. 4,444. February 27th.

MANUFACTURE OF HEAT INTERCHANGERS BY AN ELECTROLYTIC PROCESS. E. Friedheim. 4,621. February 29th. (Date applied for under International Convention, March 4th, 1907.)

ELECTRODES FOR ARC LAMPS. Allgemeine Elektricitäts Ges. 5,295. March 7th. (Date applied for under International Convention, July 5th, 1907.)

INCANDESCENT ELECTRIC LAMPS. Allgemeine Elektricitäts Ges. 5,610. March 12th. (Date applied for under International Convention, March 14th, 1907.)

PYROMETERS AND THERMOMETERS OF THE THERMO-ELECTRIC OR ELECTRICAL RESISTANCE TYPE. Siemens Bros. & Co. (Siemens & Halske Akt.-Ges.) 7,910. April 9th.

INDUCTION IGNITION COILS. R. W. Sanders and M. Greenberg. 325. January 6th.

SUSPENSION DEVICE FOR MICROPHONES. V. Tardieu. 4,286. February 25th. (Date applied for under Rule 13, November 16th, 1907.)

STARTING AND WORKING OF THREE-PHASE MOTORS FROM A SINGLE-PHASE SUPPLY. Siemens Schuckertwerke Ges. 4,433. February 27th. (Date applied for under International Convention, June 28th, 1907.) (Application for Patent of Addition to No. 1,243 of 1907.)

BRUSH-HOLDERS FOR ELECTRICAL MACHINES. Siemens Schuckertwerke Ges. 4,692. March 2nd. (Date applied for under International Convention, March 2nd, 1907.)

ELECTRIC BLOCK APPARATUS OR THE LIKE FOR RAILWAYS. Siemens Bros. & Co (Siemens & Halske Akt.-Ges.) 5,698. March 13th.